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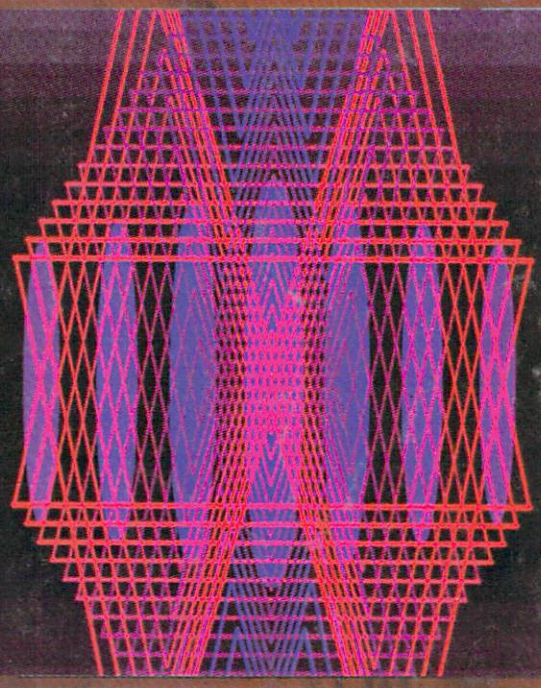

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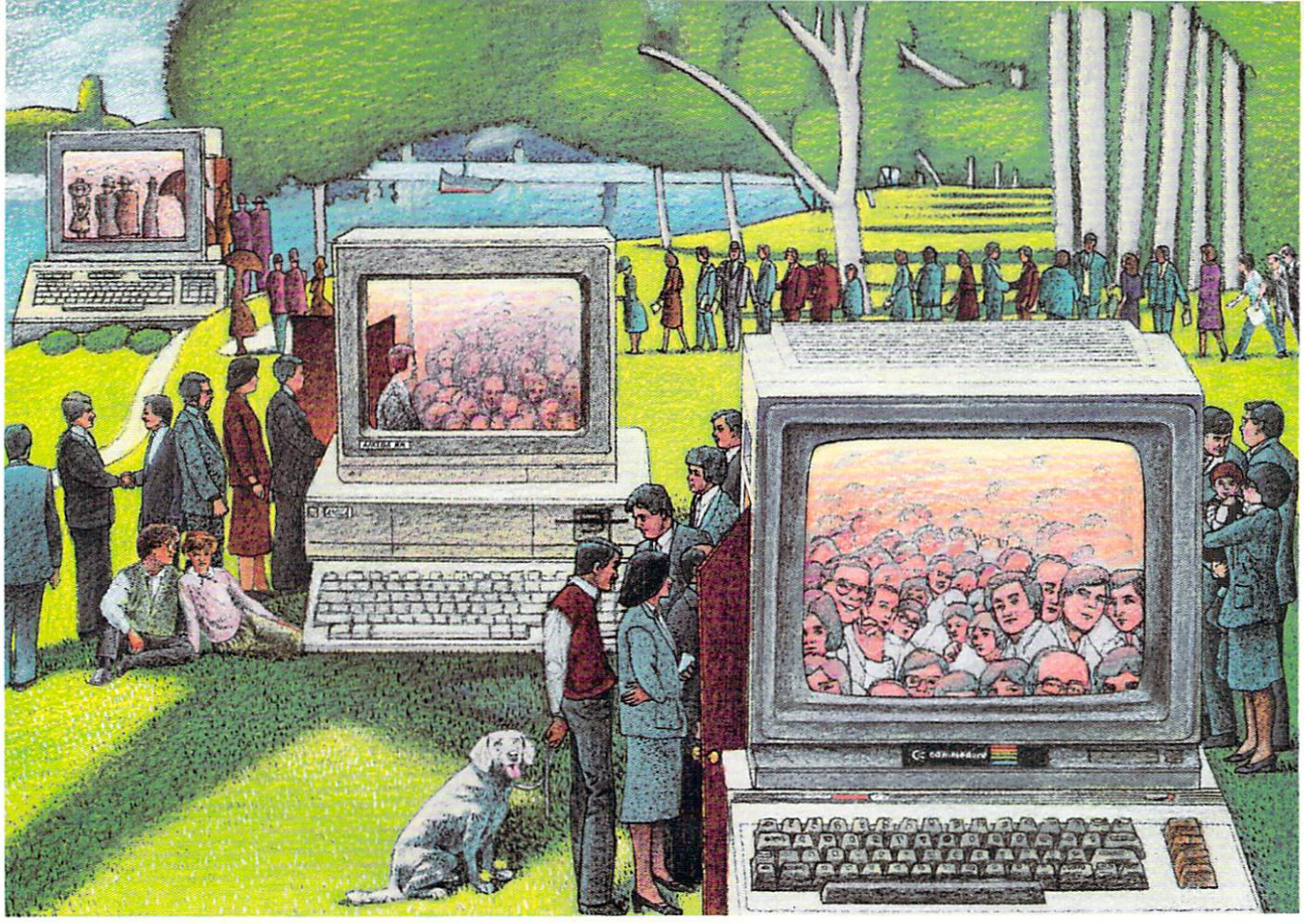

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ISSUE NO. 34 **OCTOBER 1986**

Ahoy! (ISSN #8750-4383) is published monthly by Ion International Inc., 45 W. 34th St., Suite 407, New York, NY, 10001. Subscription rate: 12 issues for $21.95, 24 issues for $41.75 (Canada $29.25 and $54.25 respectively). Second class postage paid at New York, NY 10001 and additional mailing offices.

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Postmaster, send address changes to *Ahoy!*, 45 W. 34th Street, Suite 407, New York, NY 10001. Direct all address changes or matters concerning your subscription to *Ahoy!*, P.O. Box #341, Mt. Morris, IL 61054. All editorial inquiries and software and hardware to be reviewed should be sent to *Ahoy!*, 45 W. 34th St., Suite 407, New York, NY 10001.

If you own a C-64, you

The one you purchased. And the

GEOS realizes the technical potential that has been in the C-64 all along. Speed. Power. Ease of use. Sophistication. Elegant, practical applications you might expect of a high-end personal computer, all made possible with GEOS. It's so simple—but then, so was fire. Once it caught on.

To begin at the beginning. **GEOS** stands for **GRAPHIC ENVIRONMENT OPERATING SYSTEM.** Why?

GRAPHIC: Because menus and icons replace long, typed command lines. Point and click, that's it.

ENVIRONMENT: Because GEOS provides a consistent, powerful way to use your computer. Learning new applications is a snap (or should we say click).

OPERATING SYSTEM: Because GEOS orchestrates every function so that they all work together systematically, even symphonically.

Some basics. Icons are graphic images which represent files or utilities. Each is different, and all are easy to recognize and easy to use.

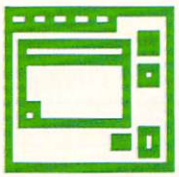
A menu is just that: a list of functions available for selection. When a menu appears, move the pointer to any item you wish. Click. Click. You're on your way.

A pointer is used to select and activate items. To move the pointer, roll the mouse or trackball or rotate the joystick. Once on target, click once to select; click a second time to activate.

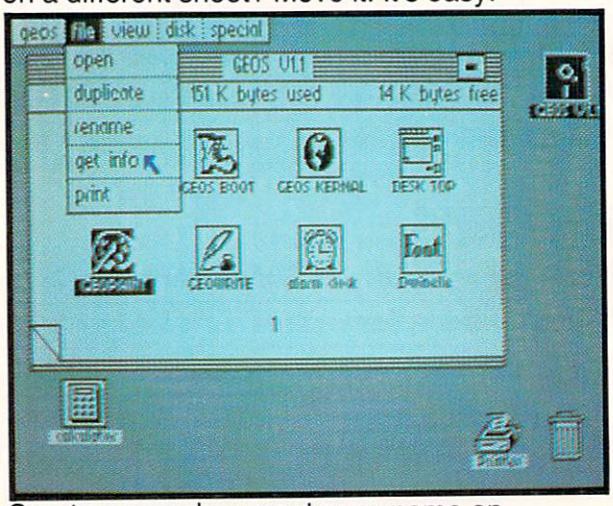
Fonts are a new way of looking at text. Choose from 5 different fonts (with more on the way). Try Dwinelle, or Roma, **bold,** or *italics,* even underline and outline. Need to fit more words on a line? Pick a smaller point size, like University 6 point, and get over one hundred characters per line.

All this and fast too. Because the integrated diskTurbo software improves 1541 disk drive performance 5 to 7 times. That's right. On both reads and writes.

GEOS can be divided into 4 areas: two functional aspects (deskTop and Desk Accessories), and two major applications (geoPaint and geoWrite).



deskTop. deskTop is a graphic interface, making file organization and management easy. As always, you call the shots. Load a disk. Files appear as icons on the disk notepad; to flip through, point at the folded corner and click. Prefer a file appear on a different sheet? Move it. It's easy.

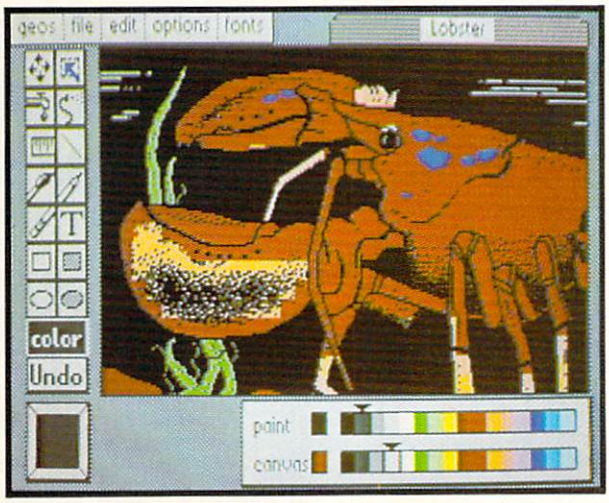


Create a new document or re-name an existing one. Want to copy a file onto the same or a different disk? Fine. Forgotten what a file contains? Select "get info" from the file menu. A description of that file's contents appears. Finished with a file? Print it. Save it. Or drop it in the trash and have done with it. Your call.

geoPaint. A full-featured, color graphics workshop at your fingertips. The pointer operates any one of the fourteen graphic tools and shapes in the drawing menu. Create masterpieces on the Drawing Window. By turns, use a pencil, an airbrush or a paint brush, each with a character all its own. Draw straight lines, squares, rectangles or circles. Fill in with any of the 32 patterns. Switch to pixel-mode, where each dot in a selected section is magnified many times its size for easy manipulation.

own two Machines.

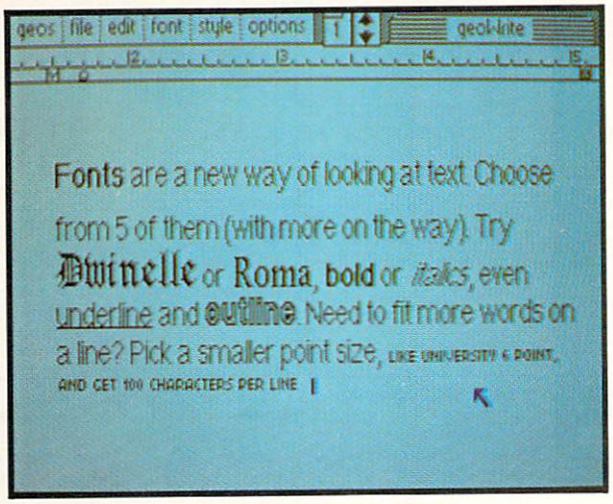
personal computer GEOS™ unlocks.



Second thoughts? Erase what you don't want. Or "UNDO" your last act. (If only life could imitate art!)

Add text if you like, in different fonts, styles or point sizes. Even change its position or layout at will.

Move or copy any part of your creation. Once done, you can include your artwork in another document—a letter home perhaps. (Won't Mother be pleased?) GEOS makes it easy.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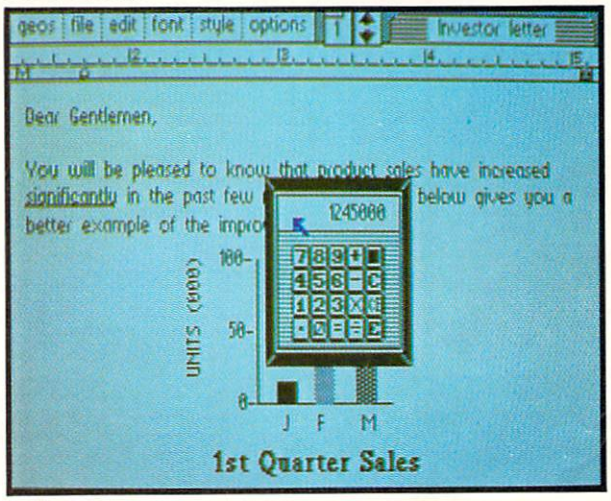
geoWrite. An easy to use, "what you see is what you get" word processor. Create documents. Insert, copy, move or delete text as you wish. Choose from 5 different fonts in many different styles and point sizes. Preview your page exactly as it will appear off the printer. Typists will appreciate tabs, word-wrap and page breaks.

Documents may contain up to 64 pages. What's more, you can move to any page instantly. If you like, you can cut selected text from one section and move or copy it to another. Add graphics from geoPaint. It's a cinch.



Desk Accessories. Handy programs you can use while in any GEOS application. These include an alarm clock, a notepad for reminders, a four-function calculator, and photo and text albums which store pictures and phrases you may then paste into applications. The Preference Manager even lets you establish parameters for everything from mouse speed to the date and time—even background color. Civilized options, every one.

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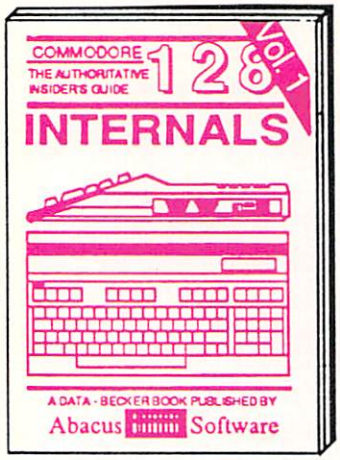
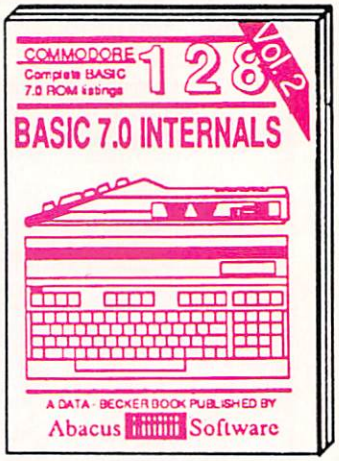
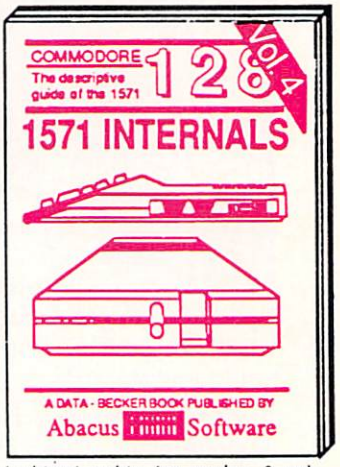


Detailed guide presents the 128's operating system, explains graphic chips, Memory Management Unit, 80 column graphics and commented ROM listings. **500pp** $19.95

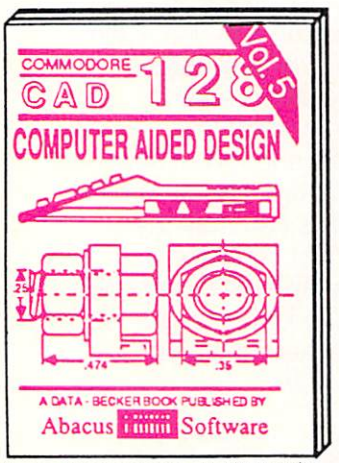


Get all the inside information on BASIC 7.0. This exhaustive handbook is complete with commented BASIC 7.0 ROM listings. Coming Summer '86. $19.95

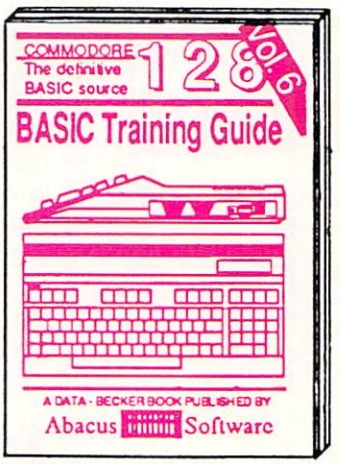
Filled with info for everyone. Covers 80 column hi-res graphics, windowing, memory layout, Kernal routines, sprites, software protection, autostarting. **300pp** $19.95



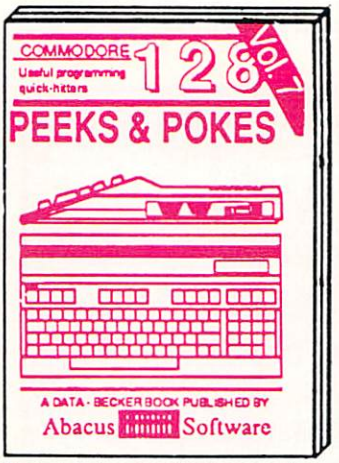
Insiders' guide for novice & advanced users. Covers sequential & relative files, & direct access commands. Describes DOS routines. Commented listings. $19.95



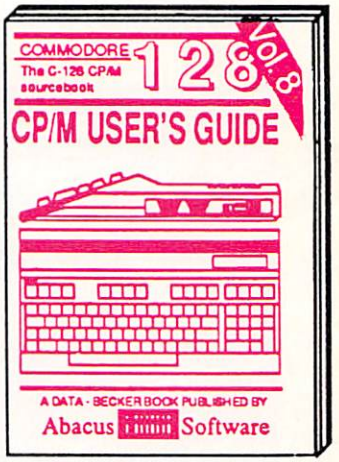
Learn fundamentals of CAD while developing your own system. Design objects on your screen to dump to a printer. Includes listings for '64 with Simon's Basic. **300pp** $19.95



Introduction to programing; problem analysis; thorough description of all BASIC commands with hundreds of examples; monitor commands; utilities; much more. $16.95



Presents dozens of programming quick-hitters. Easy and useful techniques on the operating system, stacks, zero-page, pointers, the BASIC interpreter and more. $16.95



Essential guide for everyone interested in CP/M on the 128. Simple explanation of the operating system, memory usage, CP/M utility programs, submit files & more. $19.95

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VIEW FROM THE BRIDGE

If the *Ahoy! Disk* gets any better, we'll have to subscribe ourselves...and we get it for free! These past four months, we've shipped nearly full, with programs provided by the COMAL Users Group occupying the space left over by our monthly lineup. This month, we've given COMAL a rest to provide another exciting commercial program.

The *Talking Disk* from Covox is more than a demo of their $89.95 Voice Master: its several programs are entertaining and educational in their own right. As detailed in the August *Scuttlebutt,* the $5.00 disk includes a talking keyboard, a calculator that converses in English, Spanish, and German, and instructions for creating voice synthesized programs. Because of the software's total length—over 400 blocks—we've had to double-side the *Ahoy! Disk* to fit it all in. But despite that, and the inclusion of a 28-page manual, the October disk costs the usual $7.95 (see page 54).

Believe us: they're not giving it away simply because they can't give it away. The disk and booklet would provide an outstanding introduction to the world of Commodore speech synthesis, even if you had to pay $5.00 for it—but you don't have to!

We'd love to devote the rest of this page to the bonuses we have planned for future disks (including a recent, nationally advertised release from a major game manufacturer)—but we're equally excited about the contents of this, the October issue of *Ahoy!*

• Though Cleveland M. Blakemore's *Vault of Terror* was easily the best adventure game we'd ever seen in 70 blocks or less, we knew what aspect of it would frighten readers the most: typing it in. To encourage the reluctant, we've run it in the same issue as Cleve's shorter *Penguins* (page 16). Once you've whet your appetite on the latter, you'll want to plunge headlong into the *Vault!* (Turn to page 58.)

• Each month when he hands in his column, we wonder: how long can Dale Rupert keep it up? Surely he'll have to run out of original, exciting topics for the *Rupert Report* one of these days! But he hasn't disappointed us yet...least of all this month, as he leads C-128 and C-64 users on *Analog to Digital Adventures.* These include building and programming an onscreen oscilloscope and an optical version of a Theremin. (Turn to page 20.)

• What would an issue of *Ahoy!* be without a Buck Childress program? Probably yellowed with age—because with the exception of one month, Buck's work has appeared in every issue dating back to December of last year. His latest program is his longest: *Quick Change,* a powerful BASIC search and replace. (Turn to page 52.)

• We gathered from last month's *Trapped* that Mike Hoyt knew how to pack an awful lot of program into a small amount of code. But we were nonetheless felled by *Attack Force.* (Seriously, Mike—do you have any experience with missionaries' heads?) (Turn to page 72.)

• If you believe reports that the Dvorak keyboard layout will eventually become the standard, you'll want to start getting your fingers in shape. To that end, we've presented C-64 and C-128 versions of *Dvorak Keyboard.* (Turn to page 57.)

• As rocks rain on his head and appropriate theme music plays, *Mountaineer Mack* must scramble to the top of six hills. (Turn to page 18.)

• In this month's *Commodore Roots,* Mark Andrews reveals *The Fastest Draw in the Industry*—that is, he reveals techniques that top pros use in writing fast assembly language programs. (Turn to page 27.)

• The answer to many a 128 user's dilemma, *128 to 64 Autoboot* allows the computer to go into 64 mode and automatically boot a program, when activated by a timer or otherwise. (Turn to page 50.)

• Operational with the C-64, Plus/4, C-16, or VIC 20, *Disk Checkup* helps 1541 users to diagnose the health of their floppy files. (Turn to page 97.)

• What better time than October to plan your holiday shopping? Our *Christmas '86 Preview* suggests a number of game packages due for release before the end of the year. This month's *Entertainment Software Section* also includes reviews of *Murder on the Mississippi, GBA Championship Basketball (Two-on-Two), Europe Ablaze, World Karate Championship, Oo-Topos,* and *Super Bowl Sunday Expansion Disk #2.* (Turn to page 41.)

We regret the absence of the *Cadet's Column* from this issue, but expectant motherhood made some demands on Cheryl Peterson that rendered her unable to meet this issue's deadline. One or the other had to be shelved for this month—and over our protests, Cheryl shelved us. So it's 30 days liberty for all cadets—until next month, when Cheryl introduces you to the Promal language.

But almost everything else you buy *Ahoy!* for is to be found between this month's covers: including an extra-long installment of *Tips Ahoy!, Reviews* of *21-Second Backup* and *IntraCourse,* Dale Rupert's *Commodares,* and more. If there's anything you're not getting enough of (within reason), please write to tell us. —***David Allikas***

AHOY! BBS GOES 1200 BAUD!

Effective immediately, the 24 hour a day *Ahoy!* Bulletin Board System can be accessed at 300 or 1200 baud, in 40 or 80 columns.

Corrections to programs and articles, editorial calendar for upcoming issues, and excerpts from future news sections are some of the files available for download.

Set your modem for full duplex, no parity, 1 stop bit, 8-bit word length, and dial

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SCUTTLEBUTT

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ACTIVISION PRODUCTIVITY

Activision has branched out from the entertainment business into a line of home and personal productivity programs for the C-64. The following are the first releases in the series, dubbed *Personal Choice Software:*

The *Writer's Choice* word processor includes a 50,000 word spelling checker, help screens, and a full layout preview option that allows the writer to see what a document will look like before printing it.

Filer's Choice lets the user tailormake computer "index cards" and sort records alphabetically or numerically. A report writer makes it possible to extract information from multiple fields and combine it into one file for report generation and document production. Context-sensitive help screens address specific problems.

The *Planner's Choice* spreadsheet permits the user to select column width, while horizontal and vertical windowing allows him to view different sections simultaneously. "What-if" games are provided for experimentation and modification of data.

Titles are $39.95 each, or $99.95 for the *Personal Choice Collection* of all three.

Activision, Inc., 415-960-0410 (see address list, page 14).

MANUAL PROGRAMMING

In April's *Scuttlebutt* we announced that ShareData had licensed the C-64 rights to VPL Research's "grasp" technology, consisting of a visual programming language operated by a glove input device. ShareData has now completed and released HandCommand, a transmitting device inside a lightweight cotton glove available in three sizes for lefties or righties. The position, tilt, and bend of the hand is measured in three dimensions and translated into computer operations. The wearer can for example throw an imaginary dart and have the speed and angle measured and reflected, in real time and 3-D, on the computer screen. The product was scheduled for fall release.

ShareData, 1-800-328-6061 or 612-829-0409 (see address list, page 14).

Computer Care Kit *includes anti-static spray, disk drive cleaner, more.*
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DISK LIBRARIAN

The *Disk Librarian* comprises five C-64 programs: *Single Drive Copy V/4.0* (back up disks in a maximum of three minutes on a single 1541); *Security Seven* (back up a disk onto tape in a maximum of seven minutes); *Directory Modifier* (reorganize or add lines or comments to disk directories, lock or unlock files, and change file types or names); *Disk Directory Sorter V/4.0* (read all your disk directories into one large file for editing, sorting, searching, and printing out); and *Tape-Log* (catalog disks stored on tape with *Security Seven*). Price is $35, shipping included (except COD orders); add $5.00 if you desire a backup copy.

Software Unlimited, 503-882-7110 (see address list, page 14).

AMIGA GUIDE

Focusing on graphics and sound, the *Amiga Programming Guide* ($18.95) provides readers with a basic programming foundation. Covered are initial setup, fundamentals of Amiga BASIC, LOGO, and C, information management with AmigaDOS, communication with other PCs, and interfacing with a VCR or stereo.

Que Corporation, 317-842-7162 (see address list, page 14).

COMPUTER CARE KIT

Philips ECG's $39.95 Computer Care Kit contains almost everything imaginable to promote good computer grooming, including anti-static spray, jet air cleaner, disk drive head cleaner, glass cleaner, lint free wipes, and swabs.

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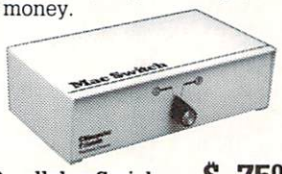

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Philips ECG, 1-800-233-8767; in PA 1-800-222-9308) (see address list, page 14).

PLUS/4 AND C-16 SOFTWARE

While the level of software support for the Plus/4 and C-16 could make even an Adam owner chuckle, a bone is thrown from time to time. Robinson Software Associates has made three available at $9.95 each plus $1.50 postage per order. *Bounty Hunter* (round up a gang of outlaws in the Old West), *Grave Robbers* (a graphic adventure requiring players to find secret treasure), and *Savings & Loan* (a home finance program that calculates principal and interest payments and amortization of loans, as well as the value of various types of savings). (See also this month's *Game Releases* heading for a Plus/4 flight simulator.)

Robinson Software Associates (see address list, page 14).

FOOTBALL HANDICAPPING

The *Professional Football Handicapping System* lets the C-64 or VIC 20 user handicap NFL games using information found in the daily paper. About five minutes is required to enter the information needed to perform the statistical analysis that will predict the winner, point spread, and total points in a game. On cassette or disk; $39.95 plus $2.00 shipping.

Software Exchange, 313-626-7208 (see address list, page 14).

SYNTHESIZER PROGRAM

The *Fastfingers* synthesizer program includes 256 preset sounds derived from the SID chip, 13 effects (glide, vibrato, wah wah, etc.), and onscreen instructions, and provides for 10 minutes of real-time recording at 60 notes per second. A 4-octave keyboard with 49 full-size keys (apparently the Mattel keyboard originally manufactured for use with Intellivision) is also available. Price of the software and manual is $24.95; with keyboard adapter $59.90; with adapter and keyboard $119.85.

See-Thru Enterprises, 519-735-2995 (see address list, page 14).

TALKING SOFTWARE

Hearsay, Inc. has released three educational games that produce speech when used with a C-64 and the Hearsay 1000 speech synthesizer/voice recognition system (see January '86 *Ahoy!*). Each $29.95, they are *Rhyme and Reason* (familiar nursery rhymes teach basics like names of animals and parts of the body), *Aqua Circus* (basic shapes, colors, counting, and simple math), and *Think Bank (Concentration*-type game that teaches arithmetic).

Hearsay, Inc., 718-232-7266 (see address list, page 14).

CP/M SOURCE

FOG, the California-based CP/M users group, is offering a library sampler of CP/M software free to C-128 users who send in the $25 yearly membership fee by December 31, 1986. In addition to Commodore's revised CPM+ operating system (the original system shipped with the 128 contained bugs that prevented the serial port from operating), the disk contains a text editors with *WordStar*-like commands, a telecommunications program designed for both the Commodore 1670 and Hayes-compatible modems, a menu-driven file utility program for making file and disk copies, viewing files, etc. (eliminating the need to memorize CP/M commands), and a disk directory manager that sorts and prints directories and shows print status. Documentation is included.

FOG, a non-profit group with 20,000 members worldwide, maintains a large library of public domain software that is available for a small copying fee. Membership includes affiliation with more than 300 local chapters, and access to a technical support hotline operating from 10 a.m. to 5:30 p.m. (Pacific time), Monday through Friday.

FOG, 415-755-2000 (see address list, page 14).

ABACUSES FOR THE 128

Three new C-128 productivity packages from Abacus, each $59.95, scheduled for September release:

In addition to the standard options

found in most terminal programs, *SpeedTerm 128* features Xmodem and Punter file transfer protocols, VT52 and VT100 terminal emulation with cursor keys, 45K capture buffer, and user-definable function keys.

TAS-128, an enhanced version of Abacus' Technical Analysis System for stock marketing charting, lets the investor automatically download indicators from DJN/RS or Warner and then build a variety of charts on the split screen: 7 moving averages, 3 oscillators, 5 volume indicators, comparison charts, trading bands, least squares, and more. Included are macro capabilities, automatic and unattended log-on, and fast draw charts using up to four windows.

PPM-128, a 128 upgrade of *Personal Portfolio Manager,* tracks performance of stocks, bonds, or options, as well as profits and losses for tax purposes.

Abacus Software, 616-241-5510 (see address list, page 14).

MY NAME IS 128. C-128.

Developed and originally distributed by Creative Software, *I Am the C-128* ($34.95) is now available from Activision. The tutorial provides C-128 users with an introduction to programming, advancing from the basic keyboard layout to animation programs and debugging. Several practice programs are included for experimentation.

Activision, Inc., 415-960-0410 (see address list, page 14).

NORTH TO VERMONT

Though you may have thought the state produced nothing but maple syrup, *Vermont Gold* ($29.95) for the C-64 deals with various aspects of prospecting for gold in the state of Vermont, including tales and history facts about prospecting in the 1800's, how to look for and find gold in Vermont, equipment needed for prospecting and how to use it, and more.

Indian Affairs, 717-842-8467 (see address list, page 14).

GAME RELEASES

SubLOGIC has made available two new $19.95 Scenery Disks for use with their C-64 flight simulation products *(Microsoft Flight Simulator, Flight Simulator II,* and *Jet):*

The San Francisco STAR Scenery Disk takes in such Bay area highlights as Fisherman's Wharf, Alcatraz Island, and the Golden Gate, Dumbarton, and Bay Bridges. Mountains, lakes, and waterways are accurately located, and airports represented in detail, down to the hangars and refueling facilities.

The Japan Scenery Disk details the area from Tokyo to Osaka, including Mt. Fuji, the Shin Kansen bullet train, Osakajo castle, and the Tokyo Tower, Palace grounds, and canal network in downtown Tokyo.

SubLOGIC Corporation, 800-637-4983 or (in IL, AK, HI) 217-359-8482 (see address list, page 14).

Two C-64 releases from SSI, each $39.95:

Roadwar 2000, set in a post-nuclear attack age, requires the gamer (as the leader of a gang that conquers cities by collecting soldiers, vehicles, and supplies) to locate eight scientists who are crucial to the survival of the world and return them to their research base. 19 types of vehicles can be modified for different terrain, attack, defense, speed, and durability tasks. During the 50 or more hours or an average game, the road warrior interacts with numerous wanderers, rabble road gangs, mutants, cannibals, and foreign invaders.

The magically endowed *Shard of Spring,* remnant of the once-whole LifeStone created by the Red Sorcerer, must be taken back from its captor, the evil enchantress Siriadne, and returned to its home on the stricken island of Ymros. The player attempts to do this with the aid of up to five other characters, searching Ymros, fighting monsters, and exploring dungeons. Spells are cast using the five elements of nature: fire, metal, wind, ice, and spirit. The game is designed to last from 40 to 80 hours.

Strategic Simulations, Inc., 415-964-1353 (see address list, page 14).

A female version of Activision's *Alter Ego* for the C-64 allows the distaff gamer to respond to hypothetical situations according to the person-

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ality profile the program creates for her based on her responses to a series of questions. She may choose instead to let the computer select her personality for her and experience life through the eyes of an unfamiliar alter ego.

Activision, Inc., 415-960-0410 (see address list, page 14).

Through October 31, 1986, specially marked packages of IntelliCreations/Datasoft's *Mind Pursuit, The Never-Ending Story, Crosscheck,* and *Mercenary* will contain a card entitling the consumer to a free three-month subscription to *Computer Entertainer*, a 16-page newsletter containing software news and reviews. The regular subscription price for the four year old publication is $22 for 12 issues. Call 818-761-1516 for more information on *Computer Entertainer*.

IntelliCreations/Datasoft, 818-886-5922 (see address list, page 14).

The first Infocom game to recreate actual locations and events, Brian Moriarty's *Trinity* ($39.95) nonetheless leads the text-adventurer into an alternate universe where magic and physics coexist and he gets the chance to change the course of history. From a magical world overgrown with giant toadstools he progresses to the Siberian tundra, a tropical island, deep underground, outer space, and finally the New Mexico desert on July 16, 1945, the date and site of the world's first atomic explosion, codenamed Trinity.

Trinity was written with Infocom's Interactive Fiction Plus development system, allowing for more extensive stories and more sophisticated user interfaces. As a result, it is only available for Commodore computers with at least 128K: the C-128 and Amiga. The game is geared for the Standard Level player.

Infocom, Inc., 617-492-6000 (see address list, page 14).

As a reporter in search of *The Scoop* on the murder of a woman in a bungalow, you will look for clues, question witnesses, and eavesdrop on conversations. Based on the Agatha Christie story, the Telarium adventure game includes full animation and a text menu that facilitates interaction.

Ace *includes talking onboard computer.*
READER SERVICE NO. 128

For the C-128; $32.95.

Telarium Corp., 617-494-1200 (see address list, page 14).

Spinnaker has licensed the rights from Britian's Cascade Games to distribute its *Ace* flight simulator, which it will do under its UXB label. The player/pilot's goal is to wipe out enemy air and ground forces, aided by multiple weapon systems, real-time overhead satellite mapping, and a talking onboard computer that advises on fuel levels and incoming missiles and aircraft. Additionally, a new Plus/4 version can be ordered from Cascade via check, credit card, or phone (see address list, page 14).

Spinnaker Software, 617-494-1200

(see address list, page 14).

Video Vegas simulates casino blackjack, draw poker, slots, and keno, providing entertainment for the beginner and practice for the pro.

Baudville, 616-957-3036 (see address list, page 14).

EDUCATIONAL SOFTWARE

Two from Gamco Industries:

Time Explorers requires students to answer time-telling questions correctly in order to advance through a cavern in search of gold. Activities are of four types: 1) type the digital time when shown a clock face; 2) type the digital time when given the time in words; 3) set the clock hands when given the digital time; and 4) set the clock hands when given the time in words. Within each, players may deal with hour, half hour, quarter hour, or five minute intervals.

Combining tic-tac-toe with a drill in money-changing skills, *Money Squares* questions future capitalists in the categories of 1) Count Money, 2) Can You Buy?, 3) Select the Fewest Coins, and 4) How Much Change?

Each C-64 program includes a student management system that automatically records up to 200 files. Price of each is $39.95; $54.95 with backup; or $164.95 for class pack.

Gamco Industries, Inc., 1-800-351-1404 (see address list, page 14).

Designed for beginning to expert typists, *Type!* ($39.95) teaches typing with real text and sentences instead of random letter drills. An arcade-style game is included. For the C-64.

Broderbund Software, 415-479-1170 (see address list, page 14).

The Linguist ($44.95) allows C-64 users to create language drills in French, Spanish, German, English, Russian, Hebrew, Japanese, or any of 13 other languages. The student selects two languages and enters as many words, phrases, or definitions in each of the chosen languages as desired. The program then quizzes him by presenting one of the elements in the pair and asking him to fill in its equivalent in the other language.

Gessler Educational Software, 212-673-3113 (see address list, page 14).

Interactive story books for children.
READER SERVICE NO. 129

The Grolier *Core Collection* of productivity software, including *The Information Connection, Friendly Filer, Easy Graph,* and *EduCalc,* will be made available to schools at savings of up to $60. Additionally, the *Database Management Enrichment Collection,* consisting of *Friendly Filer,* three *Friendly Files, NoteCard Maker,* and the *Countries of the World* and *The Great Book Search* databases, will be offered for $199.

Including over 100 lesson plans, the 192-page *Grolier's Productivity Software Across the Curriculum* provides educators with a guide to tailoring Grolier's productivity software to their curriculum needs. Ordinarily $12.95, the volume will be shipped free with orders of $75 or more.

Grolier Educational Publishing, 212-696-9750 (see address list, page 14).

Bantam has put two volumes of its *Choose Your Own Adventure* series of children's books on disk for the 64 at $34.95 each. In both animated adventures, the child becomes the main

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Bantam Electronic Publishing, 212-765-6500 (see address list below).

Two educational entries in Baudville's *Hacker Jack* line: *Guitar Wizard* (learn and analyze scales, chords, and tunings for all types of fretted string instruments) and *Ted Bear's Rainy Day Games* (Concentration, Old Maid, and Go Fish). For the C-64; $29.95 to $34.95 each.

Baudville, 616-957-3036 (see address list below).

CBS has rereleased *Mastering the SAT* in an enhanced version for the C-64 and an all-new version for the Amiga. 64 users now get a full disk of additional Skill Builders exercises, an onscreen timer, a revised management system providing for up to seven students, and faster access to questions and answers. The Amiga version includes pull-down menus, windows, scrolling, and graphics.

Each version is available in a retail school package containing program disk, backup, 152-page student workbook, and teacher's notes, for $109.95 (lab pack, $329.85), or a retail package (program disk and student workbook) for $99.95.

CBS will also market *The Observatory*, under license from Lightspeed Software. The C-64 astronomy program allows students to set up a "software telescope" anywhere on earth

Continued on page 130

Companies Mentioned in *Scuttlebutt*

Abacus Software
2201 Kalamazoo S.E.
P.O. Box 7211
Grand Rapids, MI 49510
Phone: 616-241-5510

Activision, Inc.
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Phone: 415-960-0410

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Reading, MA 01867
Phone: 617-944-3700

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Broderbund Software
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San Rafael, CA 94903-2101
Phone: 415-479-1170

CBS Interactive Learning
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Greenwich, CT 06836
Phone: 203-622-2500

Cascade Games Ltd.
Harrogate, North Yorkshire, England
Phone: (0423) 525325

FOG
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Daly City, CA 94015
Phone: 415-755-2000

Gamco Industries, Inc.
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Gessler Educational Software
900 Broadway
New York, NY 10003
Phone: 212-673-3113

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New York, NY 10016
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Hearsay Inc.
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Brooklyn, NY 11204
Phone: 718-232-7266

Indian Affairs
R.D. #4 Box 68
Moscow, PA 18444
Phone: 717-842-8467

Infocom, Inc.
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Cambridge, MA 02140
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Robinson Software Associates
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Mountain View, CA 94043
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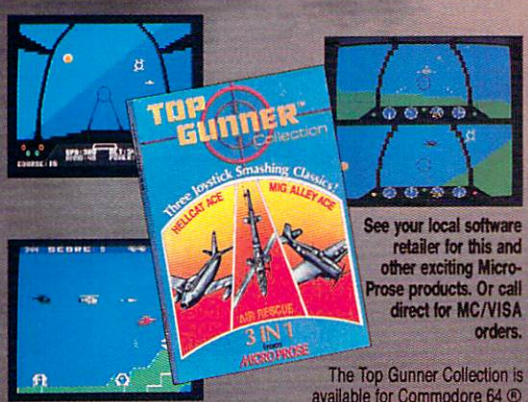

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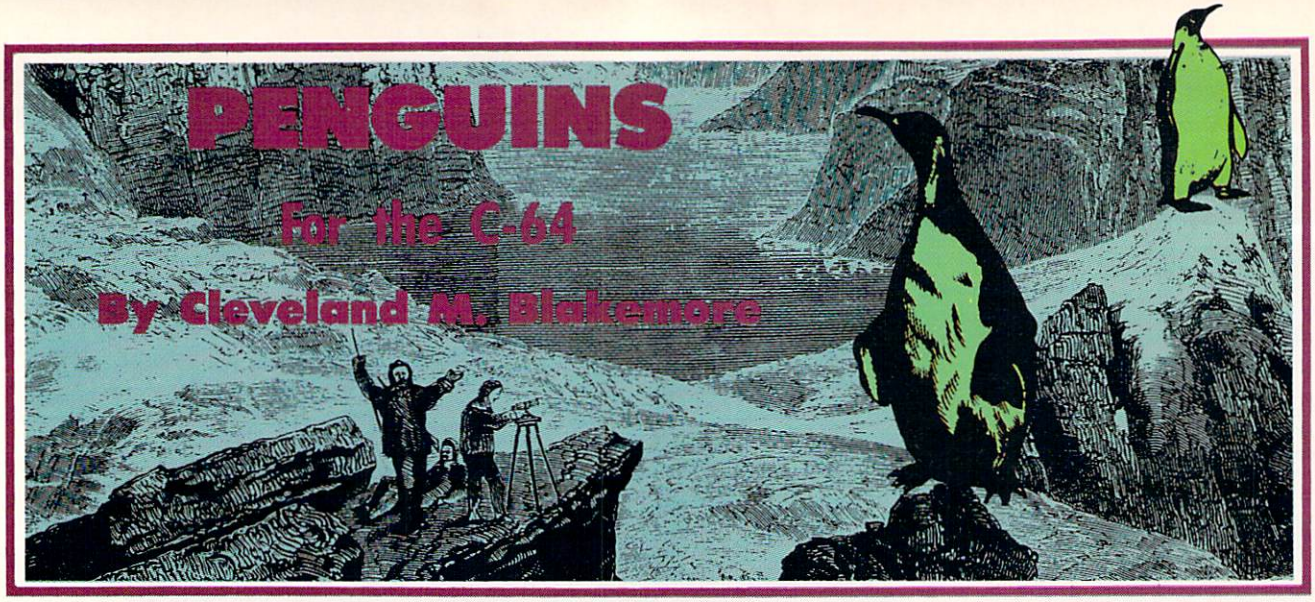

Penguins is a fast action arcade game with interrupt driven music and 24 (count 'em, 24) active sprites moving during gameplay.

The object is to get the poor penguin at the bottom of the screen to one of the ice caverns at the top. You have to cross two streams full of killer whales and get past a sniffing arctic wolverine who is looking for a few drumsticks for dinner. You also have to avoid the cave with the polar bear inside once you get to the top of the screen—you can tell which one is occupied by the set of red eyes inside.

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With a joystick plugged into Port 2, you can move the penguin in all directions as long as he is standing on one of the three snowbanks. When he is in the water, however, he will coast forward unless you pull back on the stick to bring him to a dead stop.

There are safe ice floes at intermittent intervals between the killer whales, and when you are touching one you will stop coasting. It is possible for you to cling to one of these until you pass close enough to a cavern to swim off.

Score is determined by the green bar just below the ice caverns. It gradually turns red from right to left, showing you how much bonus score is left before time runs out. When time runs out, you receive no bonus score upon entering one of the caverns.

Bonus score varies from 100 points to 3900 points, depending on how long it takes you to get across the screen to the safety of the caves.

When you enter an ice cave, you must avoid the razor-sharp icicles on either side of the entry walls to get inside safely. If you enter a cave touching one of the icicles, or there is a polar bear inside when you enter, your little penguin will sprout angel wings and float off the screen.

If you enter safely, a victory fanfare plays, the penguin jumps for joy, and a new penguin is positioned at the bottom of the screen. Each time you enter a cave safely, the game picks up the speed a little.

You have three penguins per game, denoted by the three check marks on the bar at the bottom of the screen. To start a new game, hit f1.

My high score so far is 24000+. It gets pretty hard after about eight penguins, because the wolverine and the killer whales really start hustling.

The interrupt divides the screen into three different colors, moves the three separate groups of killer whales, and propels the wolverine along the snowbank, along with updating the musical theme.

I hope you take the time to type in *Penguins*—it is a nice inexpensive addition to your game library. Since the game is entirely in ML, you will need *Flankspeed* to type it in. □ *SEE PROGRAM LISTING ON PAGE 110*

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MOUNTAINEER MACK

For the C-64

By Stephen Devine

Mountaineer Mack is a fast-paced mountain climbing game for one player. You will need both quick reflexes and patience as you make your way to the top of each mountain. Randomly falling rocks are only one of the obstacles to avoid.

There are three levels of play, with each level having six mountains of increasing difficulty. Not only is each succeeding mountain higher in elevation, but the rocks become "smarter." The speed of the rocks also increases with each level.

You start each new game with three men, and a man is lost when contact is made with an obstacle. Bonus points are awarded every time you reach the top of a mountain and still have all three of your men. It is calculated by multiplying 50 by the mountain number (shown in the lower left-hand corner of the screen).

Mack is controlled by a joystick plugged into Port 2. He may move up, down, left, or right, but not off the sides or bottom of the screen. When climbing upwards, the mountain slope scrolls downward and your current elevation is updated. Each step upward adds five points to your score and 20 to the current elevation. Blue sky will appear at the top of the screen when the peak is near. (The rocks cease to fall at this point.) If Mack collides with an object on the screen, he falls to the bottom. You stay on the same mountain until either the top is reached or all your men are lost. A chime will sound and the high score will flash at the end of the game if the previous high score is beaten.

Mountaineer Mack resides in memory from $2000-$2D5B. It is entered using *Flankspeed* (see page 103). After entering and saving this program, reset the computer by turning it off and on. Then type LOAD "MOUNTAINEER MACK",8,1. Next type SYS 8192 and hit RETURN. Press the fire button to begin the game. □

SEE PROGRAM LISTING ON PAGE 115

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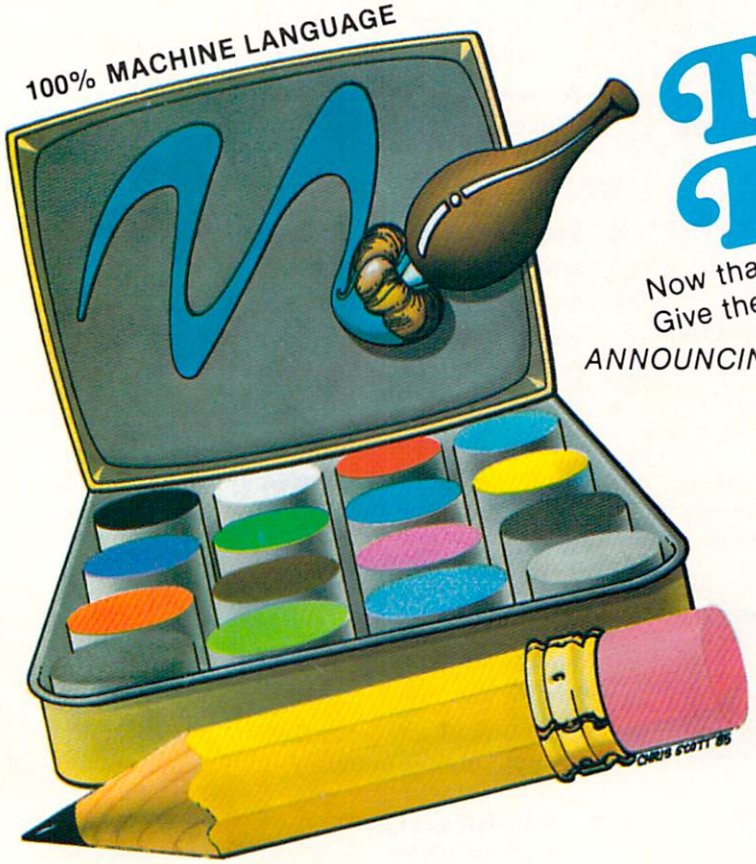

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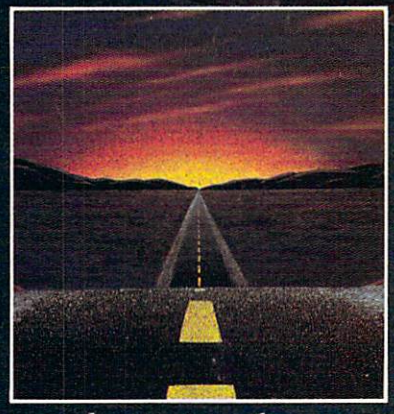

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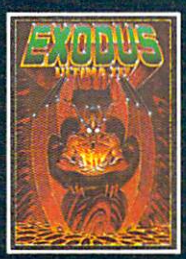

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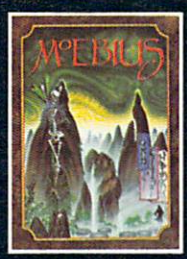

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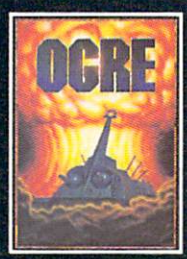

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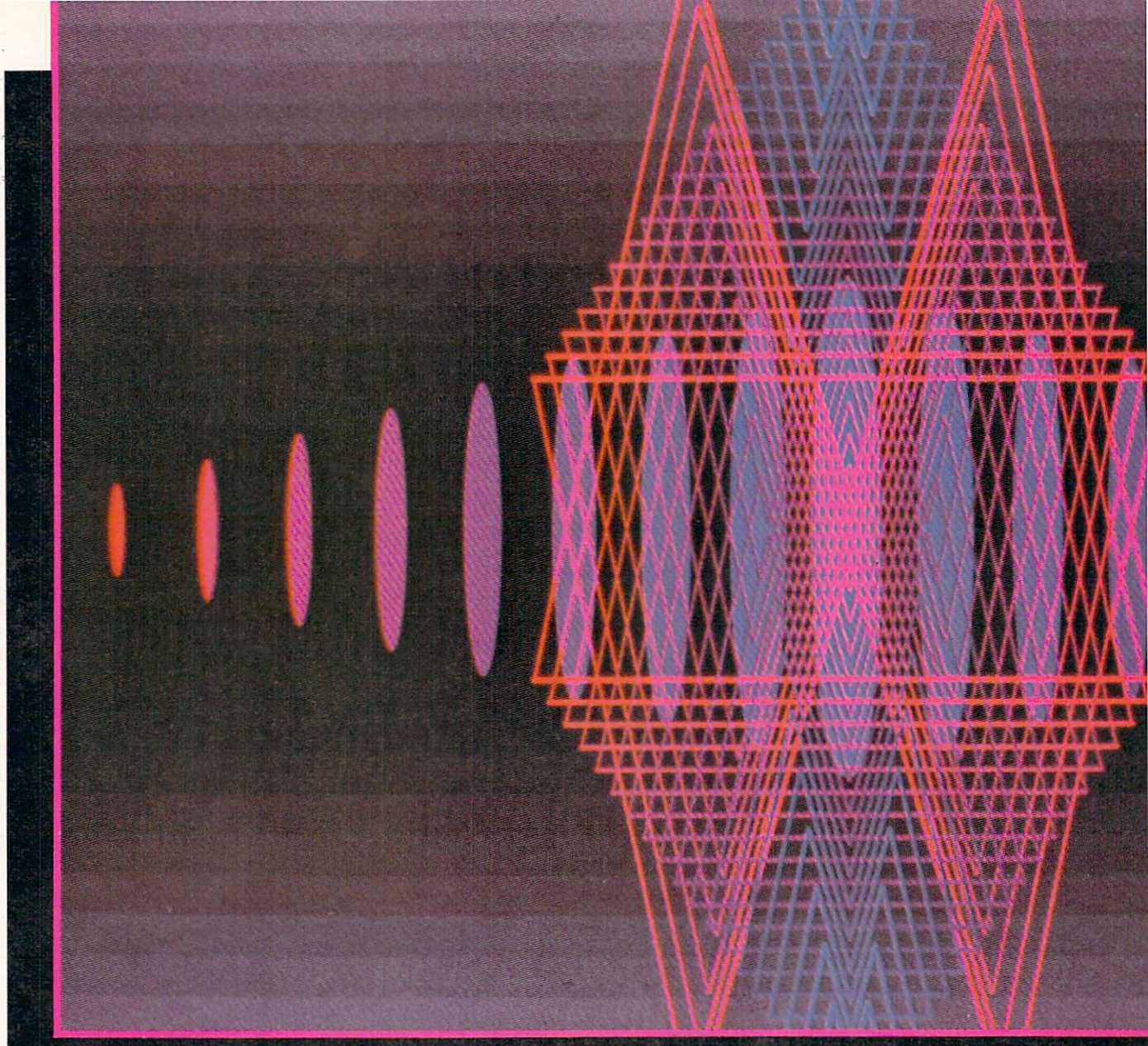


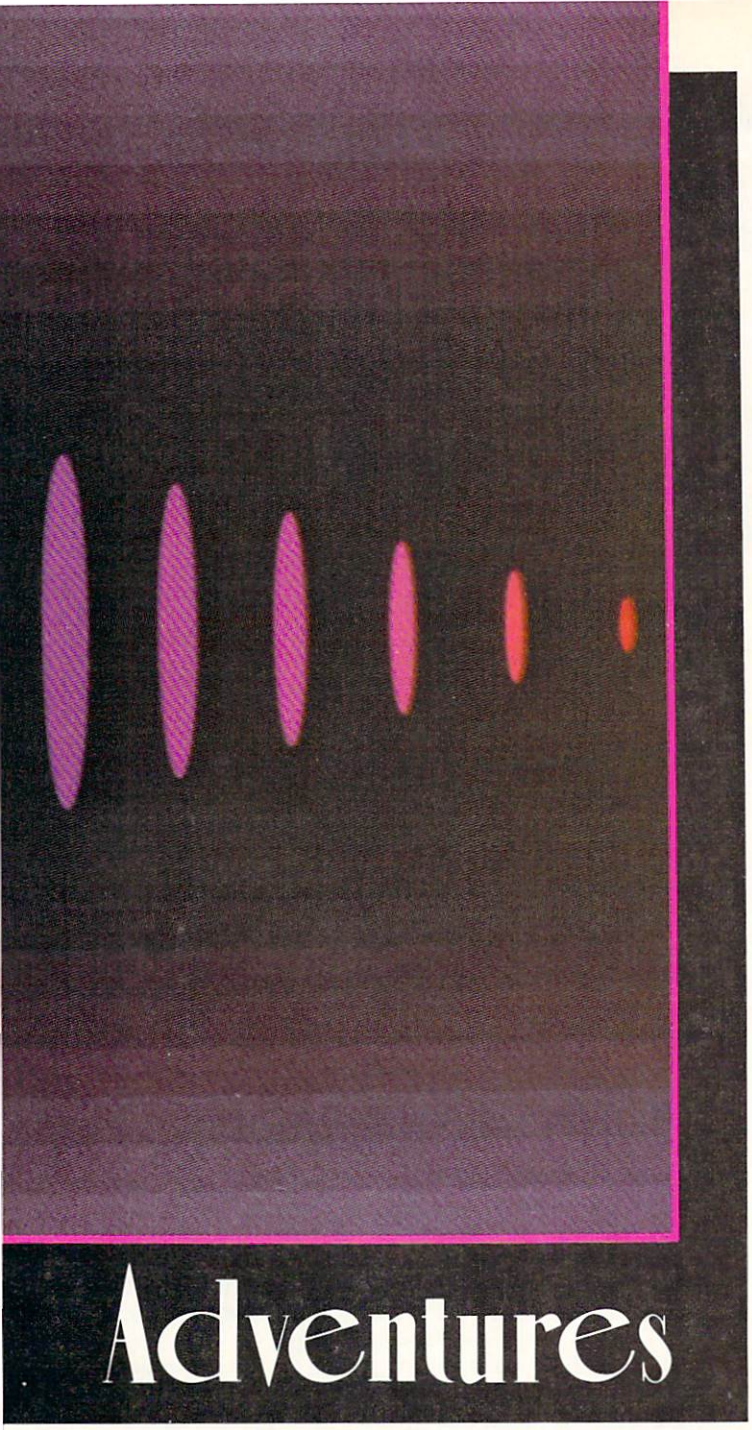
Analog to Digital

Most of the ways we have of monitoring the world are analog in nature: the electrical resistance of photocells changes in response to the amount of light on them, the height of the mercury column in a barometer rises and falls in accordance with the atmospheric pressure, the needle of a speedometer is magnetically deflected in proportion to the speed of the automobile.

Among electrical engineers are those who deal primarily with analog circuits such as amplifiers and filters, and those who deal mainly with digital circuits such as microprocessors and flip-flops. Between the two groups is the realm of analog-to-digital (A/D) and digital-to-analog (D/A) conversions.

This month we will see how to convert analog signals as they exist in the real world into digital signals where they are more readily analyzed, interpreted, and recorded in the computer. We will see how to use the C-128 (and the C-64 with additional effort) as a digital oscilloscope. Finally, to avoid the "all work and no play" syndrome, we will end up with an optical counterpart of the age-old musical instrument made famous by horror films of yesteryear, the Theremin.

The Commodore 64 and the 128 each contain a multifunction circuit called the Sound Interface Device, better known as SID. This integrated circuit has the makings of a multivoice musical synthesizer complete with oscillators, filters, and the works. An additional feature of this chip is that it contains two analog-to-digital converters. These A/D (read "A to D") converters each generate an eight-bit digital word which is proportional to the analog signal at their inputs.



Adventures

A DIGITAL OSCILLOSCOPE AND THE MAKINGS OF AN OPTICAL MUSICAL INSTRUMENT

By Dale Rupert

Photo: Comstock

The inputs to the A/D converters are accessible through Control Ports 1 and 2 on the right side of the computer. The A/D converters are intended to be used with game paddles which are plugged into the Control Port connectors. Electronically, a paddle is a variable resistor called a potentiometer. The value of its electrical resistance may be changed by rotating or sliding the handle of the paddle. The Commodore's A/D converter can handle resistances ranging from zero ohms to about 500,000 ohms.

The paddles differ from joysticks on the Commodore computers. The joystick is digital in nature: each of its four switches is either open or closed. The paddle is an analog device: its output is a continuously variable signal.

The computer can directly read the status of each joystick switch as being at a logic high (1) or a logic low (0) level. How can a computer read a paddle which may be anywhere between logic high and logic low levels? Before the computer can read a paddle's position, an analog to digital conversion must be performed. The entire range of paddle resistances is subdivided into 256 equal parts. The A/D converter takes the paddle signal and determines a numeric value from 0 to 255 which is proportional to its resistance.

For example, assume that if the paddle is turned counterclockwise, its signal level (or resistance) is low, and when turned completely clockwise, its signal level is high. The A/D converter stores a digital value of 0 in the SID register when the paddle is counterclockwise, and a digital value of 255 when the paddle is completely clockwise. If the paddle is turned halfway between the two extremes, the A/D converter generates the value 128.

The computer can interpret the position of the paddle by the size of this digital value. The paddle's position is determined with a resolution of one part out of 256 parts. Contrast this with the joystick whose position is known with a resolution of only one part out of eight. In electronics jargon, the SID chip contains two 8-bit A/D converters. The eight bits make up one byte, and one byte ranges in value from 0 to 255.

INNER WORKINGS

For those interested in the electronic details of how the analog to digital conversion occurs, have a look at the schematic diagram for the SID chip in the *Programmer's Reference Guide* (page 610 for the C-128 and page 481 for the C-64). The paddles are shown as 470,000 ohm (470 kohm) potentiometers ("pots") coming into the POT X and POT Y inputs of the SID. A 1000 picofarad capacitor is also at each input. One side of the pot goes to +5 volts.

The SID chip momentarily brings the top of the external capacitor to ground (0 volts), removing any charge from it. At the same time, it starts an 8-bit binary counter counting fixed-rate pulses. The capacitor then begins charging up through the paddle potentiometer. The smaller the resistance of the pot, the faster the capacitor can charge up. The voltage on the capacitor increases as it charges up.

This voltage comes into a circuit in the SID called a comparator. The comparator compares the voltage on the capacitor with a fixed voltage which is nominally 2.5 volts. When the voltage on the capacitor reaches a value of 2.5 volts, the output of the comparator changes from a low level to a high level. The high level at its output causes the binary counter to stop counting. The value in the counter will be between 0 and 255, depending upon how long it took the capacitor to reach the 2.5 volt level.

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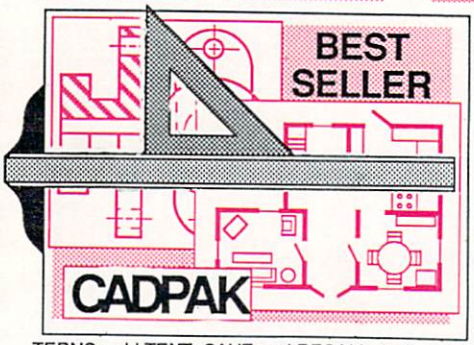

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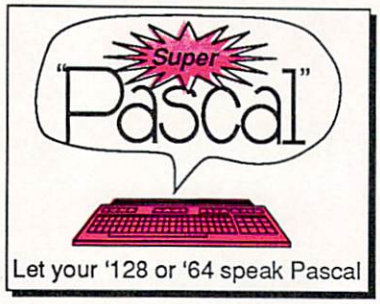

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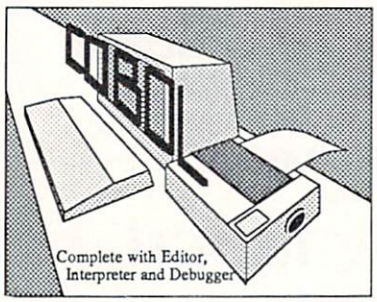

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When the resistance of the pot is very low, the capacitor reaches the 2.5 volt level very quickly, and the counter is stopped at a very low count. When the resistance of the pot is very high, the counter reaches a very high count before it is stopped.

That's all there is to it. The value in the counter is reasonably proportional to the resistance of the pot. So by reading the value of the counter which is stored in one of the SID's registers, the computer has a digital representation of the paddle's position.

Just a couple more details for the technically oriented. The actual value of the capacitor in the C-128 computer is 1800 picofarads (pF), rather than the 1000 pF shown in the SID schematic. See this for yourself in the computer schematic at the back of your *Programmer's Reference Guide* on page 722. Consequently the maximum useful pot resistance is on the order of 300,000 ohms for the C-128.

SID's two A/D converters are able to handle four paddle inputs by the process of multiplexing. In zone 6D of the schematic diagram on page 726 of the *C-128's Programmer's Reference Guide* is U2, a 4066 electronic switch. This switch selects the inputs from either Control Port 1 or Control Port 2 for conversion. BASIC 7.0 in the C-128 handles the switching, depending upon which paddle input is being read. C-64 users (and assembly language programmers) control the switching by means of bits 7 and 6 of the Complex Interface Adapter at address $DC00.

A DIGITAL OSCILLOSCOPE

With the process of analog to digital conversion understood, let's see how to use it. The program *Digital Scope* for the C-128 on page 106 reads and displays the paddle #1 input (POT X of Control Port 1) in an oscilloscopelike manner. (This program runs only on the C-128. C-64 users must provide routines to read the paddle input and to display the graphics on the screen. We will provide some additional information on this later.)

An oscilloscope (frequently called a "scope") is an electronic instrument that displays a dynamic graph of input signal level versus time. The display on the scope is a cathode ray tube (CRT), which is identical in function to the video monitor attached to your computer. On your video monitor, the electron beam which produces the image is continuously swept from left to right and from top to bottom, producing the thin scan lines (called the raster) on the screen. There is no vertical raster on a normal oscilloscope. Instead, the electron beam is continuously moved from left to right but not from top to bottom.

When there is no input signal to the scope, the electron beam repeatedly moves horizontally from left to right. This produces a horizontal line on the oscilloscope's screen. When it reaches the right edge of the screen, the beam is turned off and is rapidly brought back to the left side of the screen where the sequence is repeated.

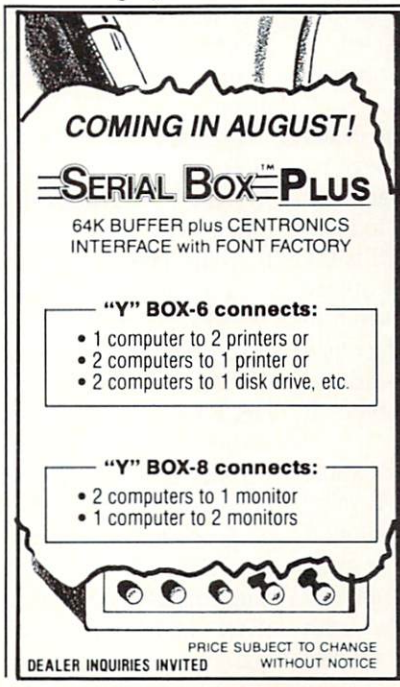
The vertical position of the electron beam is controlled by the input signal. When the input signal is large, the beam is near the top of the screen, and when the signal is small, the beam is near the bottom. The screen of the scope actually displays the combination of the vertical and horizontal motions of the electron beam.

For example, assume the input signal is very small when the beam is at the left of the screen and assume that the signal continuously increases. The image on the screen will be a diagonal line running from the lower left of the screen to the upper right. This is just what a graph would look like if you plotted input level on the vertical axis versus time on the horizontal axis. If on the next left-to-right scan of the beam the input signal remains high, the next screen image will be a horizontal line across the top of the screen. If the input signal decreases for a while and then increases again to the maximum during the next scan of the beam, the image on the screen will be "V-shaped." Some experimenting with our digital scope should clarify all this.

EXPERIMENTATION TIME

You need some hardware to perform the following experiments with the digital scope. You should have a nine-pin female D-subminiature connector (such as Radio Shack No. 276-1538 or any other similar part), a potentiometer (any type of about 500k ohms such as Radio Shack No. 271-1723, although any value of at least 10k ohms and any style can be used), and for the optically controlled musical instrument to be discussed later, you need at least one Cadmium Sulfide (CdS) photocell (such as Radio Shack No. 276-116A or 276-1657 or any other typical CdS photocells).

Solder wires at least one foot long to pins 5, 7, and 9 of the nine-pin connector. The numbers are usually visible on the connector itself. In any case, the pins are numbered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1 to 5 from left to right across the top row, and 6 to 9 from left to right across the bottom row when you view the connector from the side to which the wires will be soldered. Refer to the I/O Pinouts in the appendix of your *User's Guide*. That picture looks just like the side of the connector to which you will solder the wires.

If you are even slightly interested in electronics experimentation, I strongly recommend buying a solderless breadboard. Even the smallest ones pay for themselves in convenience very quickly. (A typical device is Radio Shack No. 276-175, although there are many other sources for this and the other parts mentioned.) These breadboards let you make connections between components easily without solder. No serious experimenter is without at least one.

The pins with wires are now:

Pin 5 – POT Y
Pin 7 – +5 volts
Pin 9 – POT X

Connect one end of the pot to the +5 volts wire and connect the middle terminal of the pot (the "wiper") to the wire from pin 9 (POT X). The other terminal of the pot and the pin 5 wire can be left unconnected. If you have a solderless breadboard, the best way to do this is to solder two wires to the pot terminals, and plug these wires into the breadboard. Then plug the wires from the connector into the breadboard. (For those unfamiliar with the breadboard, the five holes in each vertical line are internally connected so that up to five wires can be joined together simply by plugging them all into vertically adjacent holes.)

THE SOFTWARE

The *Digital Scope* program turns the C-128 into the world's slowest digital oscilloscope. On the plus side, it is no doubt the world's least expensive digital oscilloscope. The program uses the 320 by 200 high-resolution display (GRAPHIC 1). There are numerous features built in, and you can easily modify these and add your own.

Among the features of this oscilloscope are adjustable gain (vertical size), adjustable vertical position, offscreen image locators, dual traces (two parameters displayed simultaneously), freeze-frame (pause control), and running average display.

Line 70 sets the high-resolution graphics mode and clears the screen. Line 80 sets the initial gain G which converts the 0 to 255 range of the A/D into a 0 to 190 range to fit onto the graphics screen. Increasing G is equivalent to magnifying the vertical size of the image. VY in line 90 is the vertical offset of the image. Increasing VY moves the image higher up on the screen. Line 100 prints the Y value to be plotted on the screen. If this number is outside the range of 0 to 200, the image is off the screen. This value is printed on the default text screen, not on the graphics screen. It is for reference only.

The main loop starts at line 110. The horizontal X value is defined by the FOR/NEXT loop. The vertical Y value is calculated in line 130. The computer reads the value of POT AX plugged into Control Port 1 (paddle #1). The input value is multiplied by G and added to VY to determine the corresponding screen value. The result is subtracted from 200 so that a vertical screen value of 0 is at the bottom of the screen, and 200 is at the top. Line 140 puts the dot on the screen.

The routine beginning at line 150 calculates a running average of the previous MAX number of readings. MAX is defined in line 40. A second trace is shown on the screen corresponding to this averaged (filtered) value. It is displayed as a separate trace above the current input value on the screen.

This averaging routine is the most sophisticated part of the program. The plotted Y values are kept in a circular buffer YV( ) consisting of MAX elements. The pointer PTR cycles from 0 to MAX-1. At line 160 the pointer is updated to point to the oldest element in the buffer. The sum of all the values in the buffer is kept in SUM. In line 170, the oldest value in the buffer is subtracted from SUM and the current value of Y is added. Then the current value of Y is put into the buffer, replacing the oldest value. The running average is the sum of the values in the buffer SUM divided by the number of items in the buffer MAX. This is calculated in line 190, and in line 200 it is plotted 50 units above the actual input value.

The short routine at line 210 decides if the point to be plotted is on or off the screen. If it is on, it is plotted. If it is outside the range of 0 to 200, an arrow appears either at the top or bottom of the screen showing where the image is. You may use the adjustment keys discussed below to bring the image back onto the screen.

The keyboard is checked after each horizontal position is plotted. If no keys are pressed, the next value of X is chosen in line 250. When X reaches 320 at the right side of the screen, the screen is cleared in line 260 and the next scan begins at the left side of the screen in line 120.

If a key has been pressed, execution continues at line 290. The keystroke is stored in A$. The valid keystrokes are stored in the string which is the first argument of the INSTR function. K is given a value corresponding to the position of A$ within the valid keystroke string. If a key is pressed which is not in the list, the value of K is 0 and execution continues normally. If a valid key is pressed, the appropriate subroutine is called in line 310. After returning from the subroutine, the program branches back to its proper place.

The valid keystrokes are <CURSOR UP> and <CURSOR DOWN> to move the image vertically on the screen; "+" and "–" to increase or decrease the gain (vertical magnification); "C" to Clear the screen and start the scan again from the left leaving all other parameters intact; "P" to Pause the display (any other key will continue the display); and "Z" to Zero or "reinitialiZe" the gain and vertical position parameters to their original values and to restart the trace. The RUN STOP key stops the program. If you break the program to change it, you may restart by typing GOTO 120 without reinitializing all the parameters.

Lines 20, 1000, and 1010 set up error-trapping. If an error occurs when a point is to be plotted off the screen, the program just continues with the next statement because of the RESUME NEXT in line 1010. When you use error trapping, the RUN STOP key no longer works. To let RUN STOP actually stop the program, a statement such as the one in line 1000 is needed. Error number 30 corresponds

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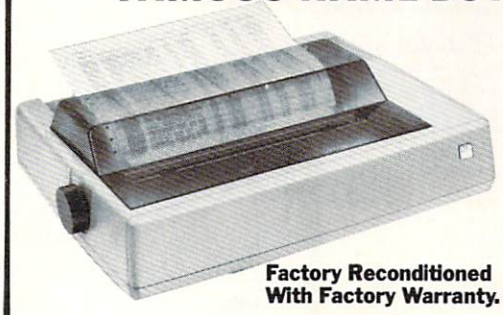

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to the RUN STOP key being pressed. If that is the case, the program ends. You may want to omit line 20 initially until you have all the SYNTAX ERRORs out of your typed-in program.

Commodore 64 users have more of a task ahead of them, although it should be enjoyable and worthwhile. You must provide a high-resolution bit-map routine to plot a point at position X,Y. A routine to do this was presented in the April 1986 edition of the *Rupert Report.* You must modify the keyboard routine of the program if dynamic input is desired.

Also, C-64 users must provide a routine to read the paddle values. A complete routine is listed on page 347 of the *C-64 Programmer's Reference Guide.* Paddle #1 and Paddle #2 (Control Port 1) can be read with the commands: P1 = PEEK(54297) : P2 = PEEK(54298). The C-64 manual says that paddles cannot be read reliably from BASIC, although it seems that the main problem is with the reading of paddles in Control Port 2.

Run this program (on the C-64 or the C-128) to display the paddle values from Control Port 1:

```
1 PRINT PEEK(54297),PEEK(54298)
2 GOTO 1
```

This gives generally consistent results on the C-128 in C-64 mode, with just a few glitches.

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THE POSSIBILITIES

There are countless ways of using this program. Experiment with changing the running average buffer length to see how more or less filtering of the input affects the output. If you put a switch in line with one side of the potentiometer, you can generate square waves by periodically opening and closing it (or simply connect and disconnect the wire to the pot).

Look at the filtered waveform to see how this low-pass filter converts a square wave into a triangle wave. You will see that if the switch is operated quickly enough, the filtered output can't keep up with the input changes, and it reaches a constant level. This is low-pass filter theory right before your very eyes! A nice thing about this simulation is that it all happens at a speed which is easily comprehended by human minds. The snail's pace of BASIC is a benefit here.

You could rig up a simple spring and lever mechanism to the shaft of the potentiometer in order to measure force or displacement. It would not require much effort to turn this program into a data-logger which stores the incoming data for future reference and interpretation. Your computer with its A/D converter is a laboratory in itself.

MAKING MUSIC

One of the more entertaining uses of this program that I have found is to replace the potentiometer with a Cadmium Sulfide photocell described earlier. The photocell acts like an optically controlled potentiometer. Increasing the amount of light on the photocell decreases its resistance and vice versa.

Add this line to the program:

```
205 SOUND 1,20000 - Y*100,2
```

Now you can change the pitch of the sound with your hand simply by covering and uncovering the photocell. The graphic display of the oscilloscope will still respond, adding a light show to this simple opto-organ. The Theremin is a registered trademark for a musical instrument which also is controlled by the movement of the player's hands. It uses body capacitance rather than light to change the pitch and volume of the music. There is something magical about playing music by simply waving your hands. Children are as fascinated by this ability as adults are.

It is very easy to add another photocell to control volume using the VOL command. For some very exotic effects, change line 205 above to let the photocell control other properties of the sound such as sweep, waveform, and pulse width. With as many as four independent photocells controlling numerous sound and screen parameters, you could create a synthesized orchestra and light show controlled by just your fingertips.

We have barely begun to explore the possibilities for using the A/D converters in the Commodore computers. No doubt many readers will not bother to buy the few components needed to begin experimenting. Those of us who do bother will know what the others are missing. Let me know of some of the applications you come up with. We will have other A/D adventures in future issues. ☐

SEE PROGRAM LISTING ON PAGE 106

THE FASTEST DRAW IN THE INDUSTRY

Techniques Professional Programmers Use To Write Super Fast Assembly Language Programs

By Mark Andrews

We all know how fast machine language is—and now we're going to learn how to make it even faster. This month we'll reveal some of the secrets that professional programmers use when they want to write super fast assembly language programs.

Over the past few months, we've seen how hopelessly inadequate BASIC is as a tool for writing high-resolution graphics programs. Last month we translated one hi-res BASIC program into assembly language and saw how much faster it ran. Now we're going to soup up last month's program so that it runs even faster. And by the time we're finished, we'll have it running at real machine language speed.

IMPROVING THE HRDEMO.S PROGRAM

Last month's program was called HRDEMO.S, and this month's revision is called RECTANGLE.S. HRDEMO.S didn't do much; it merely drew a big empty square on a high-resolution screen. RECTANGLE.S, as its name implies, performs a similar function: it will draw either a square or a rectangle on the screen, and it will do the job much, much faster than its predecessor. In addition, it lets the programmer control the dimensions and the size of the rectangle, and even gives him control over where the rectangle will be displayed on the screen.

RECTANGLE.S, like HRDEMO.S, was written using a *Merlin 64* assembler and is designed to run on a Commodore 128 in 40-column high-resolution mode. With minor modifications, the program can be typed and assembled using any other assembler compatible with a C-128, and it can also be altered quite easily to run on a Commodore 64. The techniques needed to make these changes have been explained in previous columns, and are also discussed in my book *Commodore 64/128 Assembly Language Programming,* published by Sams.

PLOTTING A RECTANGLE

The RECTANGLE.S program appears on page 104. When the program has been typed, assembled, and saved on a disk, it can be called and executed using RECTANGLE.BAS, the BASIC program following it at the bottom of page 105.

To control the size, dimensions, and location of the rectangle drawn by the two programs, all the C-128 user has to do is change the values of the variables in lines 30 through 60 of the RECTANGLE.BAS program. The variables HST and HND are used to set the starting and ending points of the horizontal lines that are used to draw the rectangle. The starting and ending points of the rectangle's sides are determined by the variables VST and VND. So, by changing the values of these four variables, the user can choose the shape, size, and location of the rectangle displayed on the C-128's 320 dot by 200 line hi-res screen.

WHY 'RECTANGLE.S' IS FASTER

There are two main reasons why RECTANGLE.S runs so much faster than HRDEMO.S. For one thing, it doesn't have to perform as many calculations each time it plots a dot on the screen. For another, a number of the major calculations it does perform are shorter and faster.

GENERATING A BIT-MAPPED DISPLAY

To understand what has made these improvements possible, it's necessary to have some understanding of how the C-128 produces hi-res screen graphics in its 40-column mode. So here's a brief review of some facts that appeared in last month's column, together with some new information that has never, to my knowledge, appeared in print:

As you may recall from last month's column, each dot on the C-128's hi-res screen reflects the state of one bit stored in RAM. If the data bit that controls a screen dot is set to 1, its corresponding dot on the screen will be lit. But if the same bit is cleared to 0, its corresponding dot will be dark.

The bits that control the dots on the screen are all stored in a block of memory called a *screen map.* And the technique used to generate a display from a screen map is called *bit-mapping.* (There is another screen map used to control the *color* of each dot on the screen, but we won't get involved in that in this column.)

The bit map used to generate the screen in RECTANGLE.S begins at memory address $2000, or 8192 in decimal. It is labeled SCRBAS (for "screen base") in line 19, and is referred to by that label throughout the program.

HOW BIT-MAPPING WORKS

There are 64,000 dots on a 40-column high-resolution screen, so it takes 64,000 bits—or 8000 bytes—of memory to store a screenful of bit-mapped data. But, as you may recall from last month's column, the order in which these 8000 bytes are stored in memory is very different from the order in which they are displayed on the screen.

In memory, the bytes used to create a screen map are simply stored in consecutive order, beginning with byte 0 and ending with byte 7999. But when the C-128 generates a video display, it divides the screen up into a grid of 1000 rectangles, each containing eight bytes. The eight bytes that make up each rectangle are stacked one on top of the other, like pancakes. And the 1000 eight-byte rectangles on the screen are arranged into a matrix that is 40 columns wide by 25 columns high—exactly the same arrangement that the C-128 uses to generate a 40-column text display.

This kind of screen layout makes it very easy to program a text display, since the eight-byte rectangle used to form each character displayed on the screen in the C- 128's text mode can be fetched from eight consecutive bytes in memory. But when the C-128 is in 40-column high-resolution mode, bit-mapping a dot on a screen becomes considerably more complicated. To plot a dot on a hi-res screen, a program must carry out three separate operations. First, the eight-byte rectangle in which the dot appears must be located. Then the byte (or *line*) inside that rectangle in which the dot appears must be determined. Finally, the dot's position in the *byte* in which it appears must be pinpointed. Only then can the dot be plotted on the screen.

Before any of the above operations can be carried out on a given dot, however, the dot's exact position on the screen must be determined. Since there are 40 columns of rectangles on the screen, and since there are eight horizontal dots in each column, there are 320 horizontal positions on the screen in which a dot can appear. So the horizontal position of each dot on the screen can be determined by using a set of 320 horizontal coordinates, or *X-coordinates*, which are usually numbered from 0 to 319.

Going down the screen, there are 25 rows of eight-byte rectangles. So the vertical position of each dot on the screen can be determined by using a set of 200 vertical coordinates, or *Y-coordinates*, which are usually numbered from 0 to 199.

DOT-PLOTTING FORMULAS

The first step in converting a dot's screen location into its corresponding bit in memory is to divide the dot's vertical coordinate, or Y coordinate, by 8. The result of this operation will be the row number of the eight-byte rectangle in which the dot appears. The calculation can be performed using the following formula:

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```
ROW = INT(Y/8)
```

Next, the dot's horizontal position, or X coordinate, must also be divided by 8. The result of this operation will be the column number of the eight-byte rectangle in which the dot appears. The formula used can be written:

```
COL = INT(X/8)
```

When the two operations above have been carried out, the dot's horizontal position within its eight-byte rectangle must be calculated. This formula will do that job:

```
LINE = Y AND 7
```

When all that's done, a formula like this can be used to bring all the previous formulas together and calculate the position of the byte in which the desired dot appears:

```
BYTE = ROW * 320 + COL * 8 + LINE + BASE
```

HOW IT WORKS

As in the previous formulas, the variable ROW in the above formula represents the horizontal row in which the rectangle that contains the dot appears, and the variable COL represents the vertical column in which the rectangle is situated. BASE represents the starting address of the screen map being used, and LINE represents the line number of the desired byte on a 200-line high-resolution screen (with the lines numbered 0 through 199). The ROW variable is multiplied by 320 because there are 320 dots in a screen line, and the COL variable is multiplied by 8 because there are eight lines of bytes in each screen rectangle.

ONE LAST DETAIL

After this last calculation has been carried out, one complicating factor still must be taken care of. The complication is that the eight bits of data which form each byte on the screen are also arranged in a different order in RAM from the order in which they appear on the screen. In memory, the bits that make up a byte are arranged from right to left. But on the screen, the eight dots that make up a byte are arranged in just the opposite order: from left to right.

Because of this complication, one last formula must be used to reverse the positions of the bits in a byte so that they will appear in the proper order when they are displayed on the screen. This formula is often written this way:

```
BIT = 7 - (X AND 7)
POKE BYTE, PEEK(BYTE) OR 2^BIT
```

ON WITH THE PROGRAM

Now that we know how a dot's position on a screen can be converted into its corresponding position in RAM, we're ready to see exactly how this month's RECTANGLE.S program differs from the HRDEMO.S program described in this space last month. The most important difference is this: Every time HRDEMO.S plotted a dot, it used the series of formulas presented above to calculate the dot's position on the screen. But RECTANGLE.S does not perform every

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This is the new word processor from Vizastar's author, Kelvin Lacy and is the successor to Omniwriter, which he also wrote. All the features of Omniwriter are there, plus many significant enhancements, like auto pagination, on-line help, pull-down menus, full-function calculator and more. Up to 8 'newspaper-style' variable-width columns can help with newsletters.

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single one of those calculations every time it plots a dot; instead, it consults something called a *Y-lookup table* and simply *looks up* the starting address in RAM of the screen line on which the desired dot appears. The program then calculates the dot's horizontal coordinate, or *X-offset,* and adds it to the Y-coordinate address which it has found in its Y-lookup table. And the result of this calculation is the dot's address in RAM. This procedure considerably reduces the number of calculations that must be carried out to plot a dot on a screen and can significantly increase the operating speed of a program.

The Y-lookup table used in RECTANGLE.S is set up in lines 97 through 141. As the table is created, it is stored in a block of memory that begins at memory address $8000.

Actually, two tables are set up in this section of the program; the low byte of each Y address is stored in a table that starts at memory address $8000, and the high byte of each Y address is stored in a second table that begins at $8100. This may sound like a strange way to set up an address table, but it makes good sense, since the same offset that is used to fetch the high byte of a Y address can also be used to fetch the low byte.

A CLOSER LOOK

Now let's take a closer look at how a Y-lookup table works. First, the 8502 Y register is used to create a loop in which the starting address of each line on the screen is loaded into the accumulator, beginning with line 0 and ending with line 199.

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In lines 106 through 110, each line number is divided by eight to pinpoint the row of eight-byte rectangles in which the dot appears. But this division is carried out in a streamlined way, not in the slow old-fashioned way that was used in last month's program. Instead, each time a line number is loaded into the accumulator, each bit of the number is moved three places to the right using three LSR (logical shift right) instructions. Since the bits in a binary byte progress from right to left in powers of two, the easiest way to divide a bit by 2 is to shift each bit in the byte one place to the right. Shifting each bit two places to the right is equivalent to dividing the bit by 4, a three-bit shift to the right is the same as dividing by 8, and so on. So three shifts to the right are used to divide the contents of the accumulator by 8 in the RECTANGLE.S program.

In lines 112 through 126, the row number that has just been calculated is multiplied by 320 using a multiplication subroutine that appears in lines 77 through 95. This routine looks much like the 16-bit multiplication subroutine that appeared in the HRDEMO.S program last month, but a close comparison will show that it's a few bytes shorter. And every little bit (or byte) helps when you're trying to speed up a program.

After each row number has been multiplied by 320, the product is added to the starting address of the screen map, and the sum is stored in the low-byte and high-byte lookup tables that start at $8000 and $8100. This procedure continues until both tables have been filled in.

After the program has created its Y-lookup table, it moves on to the process of drawing a rectangle on the screen—with the help, of course, of values POKEd in during the execution of the RECTANGLE.BAS program. When the necessary values have been POKEd in, the program first calculates the X offset that must be used to display each dot. It performs this calculation in much the same way that last month's program did. But then, in lines 293 through 300, it looks up the starting address of each screen line. Finally, it adds each Y line address to the appropriate X coordinate with the help of indirect (Y-register) addressing, and thus determines the location of the byte in which each desired dot appears.

ANOTHER SHORTCUT

Still another tricky shortcut is used in lines 308 through 310 of RECTANGLE.S. In these lines, the equation

```
BIT = 7 - (X AND 7)
```

is solved by using another table—a very short one that appears in line 52. Since the purpose of this formula is to reverse the order of the bits in a byte before displaying the byte on a screen, the solving of the equation can be speeded up significantly by dispensing with calculations altogether and resorting to the use of a table. I'll leave it up to you to figure out why.

Now you know how to draw lines and rectangles on a high-resolution screen at speeds matching those achieved in commercial-grade graphics programs. Next month we'll reveal some more tricks of the trade and see how joysticks, paddles, and mice can be used to control fast-action graphics on a high-resolution screen. □

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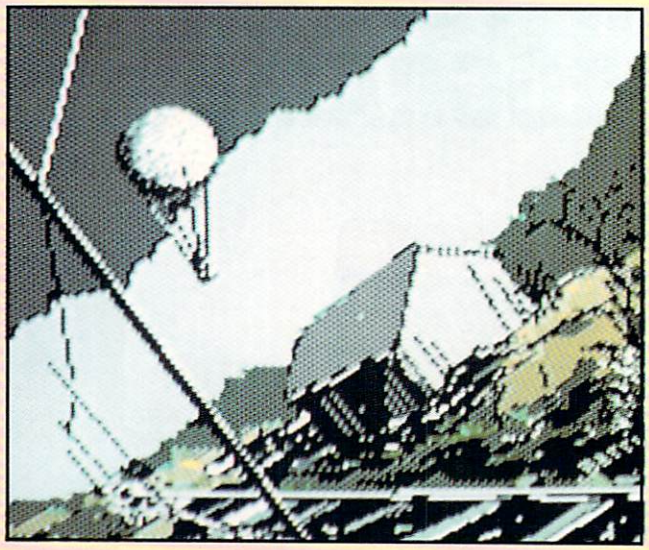

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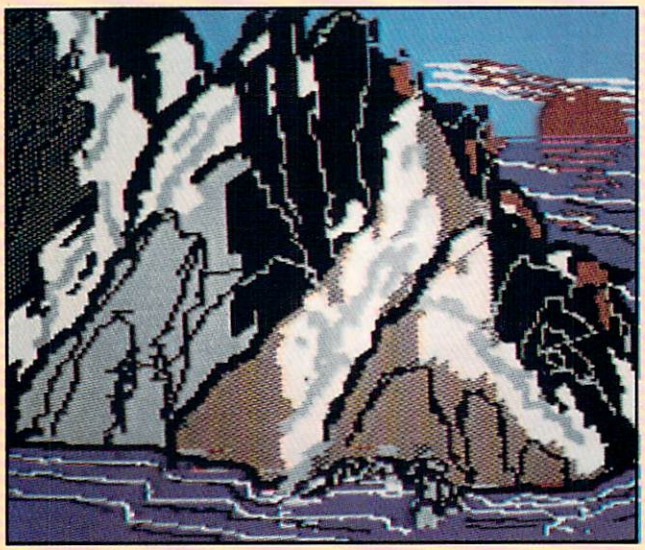
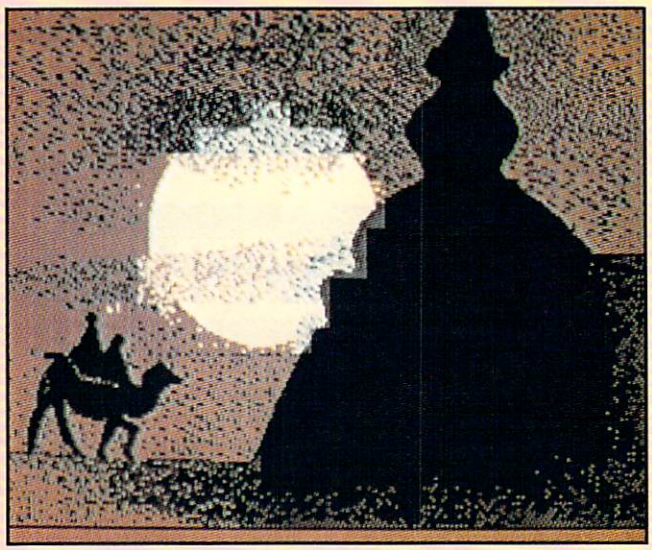
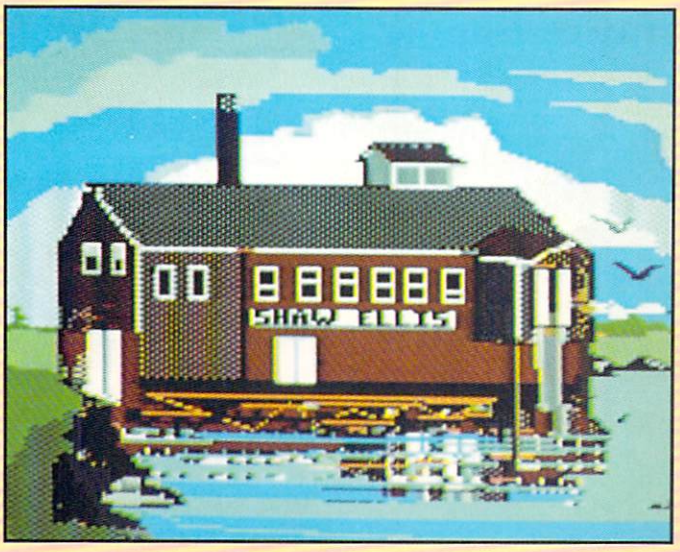
The *Ahoy! Art Gallery* offers the opportunity for fame and fortune to any and all aspiring Commodore artists. Simply send Morton (see address above) your work on disk indicating the drawing package or file format of the images. All graphics produced on the C-64/C-128 and Plus/4 computers are eligible. In exchange your work will receive the opportunity for display in these pages. All published works will receive royalties based on the monthly *Art Gallery* disk sales. In addition, both published and unpublished images may be included on the various *Art Gallery* collection disks.

Note that the *Art Gallery* is not a contest. Published pictures are selected in an arbitrary and capricious fashion by the *Ahoy!* Art Director based solely on the artistic merit of the individual images.

As we write these words in late July, our thoughts naturally turn to all the places we're too busy putting out *Ahoy!* to vacation to. But we can do the next best thing, and wing around the world via an *Art Gallery* travelogue. Hovering directly above is Barri Olson's *Balloon,* rendered by the Madison, WI artist on the Koala Pad with *Koala Painter* software. The same artistic tools were employed by Alberto Valsecchi (Milano, Italy) in the creation of *Lake* at right—a masterpiece that does his Renaissance ancestors proud. At bottom left is *Rocks* by Earl Hamner (Milpitas, CA). Beside it is *Heiching* by Ma Luo (Winnipeg, Manitoba), created with *Flexidraw.* Following our noses to the right, we find the *Shaw & Ellis Clam Canning Factory* by Robert M. Ellis (Quebec, ONT), drawn from his memories of Pocologan, a small fishing village in New Brunswick. At far right (or Far East) is another by Ma Luo: *Qingzhao.*







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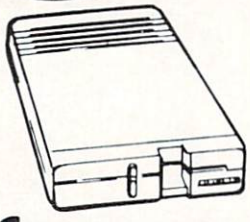

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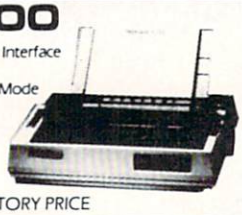

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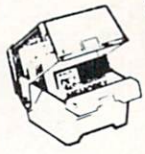

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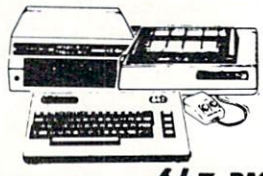

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Reader Service No. 106

TIPS AHOY!

Compiled by Michael R. Davila

Contributors to *Tips Ahoy!* can earn up to $50—and in some cases more—for their programming or hardware insights. Send your best to *Tips Ahoy!*, c/o *Ahoy!* Magazine, Ion International Inc., 45 West 34th Street—Suite 407, New York, NY 10001. If your tip includes a routine of more than 20 lines in length, including a copy on disk wouldn't hurt your chances of acceptance one bit. Include a stamped and self-addressed envelope if you want your submission returned. Payment is made on acceptance.

COMAL 0.14 FAST DUMP

I have good news for all the owners of Commodore 1525/MPS 801 printers! I've written a screen dump program that will dump a COMAL 0.14 high resolution screen in about 2½ minutes. It is short, fast, and easy to use. First, type in and save the BASIC loader program. Second, load and run the BASIC loader program to install the machine language program into a safe spot of memory. Last, load your copy of COMAL 0.14 and run it as usual. That's it! When you are ready to dump a screen, make sure the printer is turned on and the paper is adjusted correctly. Then enter this command: SYS 52736 <RETURN>. The picture will be printed sideways in about 2½ minutes. If you've ever used a BASIC screen dump (over an hour) or a COMAL version (about 25 minutes), you'll really like the speed improvement this program makes. The SYS command can be entered from within a running program or from the keyboard. It resides in the RS-232 buffer area ($CE00-$CFFF), so it shouldn't be affected by any normal programs that you write.

—Mark S. Lewis
Odessa, TX

```
·10 I=52736
·20 READ A
·25 IF A=256 THEN 40
·30 POKE I,A:I=I+1:GOTO20
·40 END
·52736 DATA 169,80,32,144,255,24,169,4
·52744 DATA 160,7,162,4,32,186,255,169
·52752 DATA 0,32,189,255,32,192,255,144
·52760 DATA 1,96,162,4,32,201,255,144
·52768 DATA 1,96,169,8,32,210,255,169
·52776 DATA 0,141,178,207,141,179,207,169
·52784 DATA 199,141,183,207,169,0,141,177
·52792 DATA 207,169,0,141,166,207,24,173
·52800 DATA 178,207,109,166,207,141,180,2
07
·52808 DATA 173,179,207,105,0,141,181,207
·52816 DATA 173,180,207,41,7,141,182,207
·52824 DATA 45,166,207,240,3,76,253,206
·52832 DATA 173,183,207,41,248,141,167,20
7
·52840 DATA 169,0,141,168,207,173,167,207
·52848 DATA 24,42,46,168,207,42,46,168
·52856 DATA 207,42,46,168,207,141,185,207
·52864 DATA 173,168,207,141,186,207,173,1
85
·52872 DATA 207,42,46,168,207,42,46,168
·52880 DATA 207,24,109,185,207,141,185,20
7
·52888 DATA 173,168,207,109,186,207,141,1
86
·52896 DATA 207,169,248,45,180,207,141,18
7
·52904 DATA 207,169,1,45,181,207,141,188
·52912 DATA 207,173,183,207,41,7,141,184
·52920 DATA 207,173,164,207,141,167,207,1
73
·52928 DATA 165,207,141,168,207,24,173,18
5
·52936 DATA 207,109,167,207,141,167,207,1
73
·52944 DATA 186,207,109,168,207,141,168,2
07
```


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```
·52952 DATA 24,173,187,207,109,167,207,14
1
·52960 DATA 167,207,173,188,207,109,168,2
07
·52968 DATA 141,168,207,24,173,184,207,10
9
·52976 DATA 167,207,141,167,207,169,0,109
·52984 DATA 168,207,141,168,207,173,167,2
07
·52992 DATA 133,251,173,168,207,133,252,1
20
·53000 DATA 165,1,141,189,207,169,53,133
·53008 DATA 1,160,0,177,251,141,190,207
·53016 DATA 173,189,207,133,1,88,56,169
·53024 DATA 7,237,182,207,168,185,169,207
·53032 DATA 45,190,207,141,184,207,56,173
·53040 DATA 184,207,233,1,144,13,172,166
·53048 DATA 207,185,169,207,24,109,177,20
7
·53056 DATA 141,177,207,173,166,207,201,6
·53064 DATA 240,6,238,166,207,76,62,206
·53072 DATA 24,173,177,207,105,128,32,210
·53080 DATA 255,173,183,207,208,3,76,103
·53088 DATA 207,206,183,207,76,52,206,169
·53096 DATA 13,32,210,255,173,178,207,201
·53104 DATA 59,208,10,173,179,207,201,1
·53112 DATA 208,3,76,145,207,24,173,178
·53120 DATA 207,105,7,141,178,207,173,179
·53128 DATA 207,105,0,141,179,207,76,47
·53136 DATA 206,169,15,32,210,255,169,13
·53144 DATA 32,210,255,169,4,32,195,255
·53152 DATA 32,204,255,96,0,224,0,0
·53160 DATA 0,1,2,4,8,16,32,64
·53168 DATA 128,0,0,0,0,0,0,0
·53176 DATA 0,0,0,0,0,0,0,256
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Reader Service No. 120

REPROGRAMMING THE 128 HELP KEY

If you think the HELP key on the Commodore 128 is for wimps, good news: you can reprogram it. The method is a little more complicated than the KEY command, but not much. Set A$, in line 10, to any BASIC 7.0 keyword or series of keywords. If immediate execution is desired include CHR$(13) in the manner shown. The HELP command is still available by typing it in direct mode. —Ed Horgan
Coatesville, PA

```
10 A$="GOTO50000"+CHR$(13)
20 FOR I = 4106 TO 4339
30 IF PEEK(I)=72 AND PEEK(I+3)=80 THEN A
=I
40 NEXT
50 J=1
60 FOR I = A TO A+LEN(A$)
70 POKE I,ASC(MID$(A$,J,1)):J=J+1
80 NEXT
90 POKE 4105,LEN(A$)
```

STRINGING MACHINE CODE ROUTINES

At times it is convenient to stash short machine language routines within a BASIC program to avoid conflicts, or to leave the customary memory areas free for other uses. The program segment shown here allows a machine code routine shorter than 256 bytes to be housed within a BASIC program in such a way as to be visually readable, LISTable, EDITable, SAVEable, LOADable, and executable with no problems. It requires no DATA statements, so it does not interfere with normal use of BASIC's RESTORE command. The example code shown is the "RESTORE LN" routine by Bob Renaud published in the March '86 *Ahoy!*

Three-digit decimal machine code bytes separated by a single space are typed into strings D1$, D2$, D3$, etc. Upon running the program, the code numbers are sequentially concatenated into string MC$ by Line 200 and the subroutine in Lines 140 and 150. At any time thereafter the DATA pointer can be restored to any desired line number by a program line like line 240. This equates MC$ to itself to ensure that its text is at the bottom of the active strings area at the moment of use, so its address can be found by PEEKing locations 51 and 52. The routine is executed by a SYS call to that address, followed by a comma and the target line number. —C.C. Stalder
Waynesville, NC

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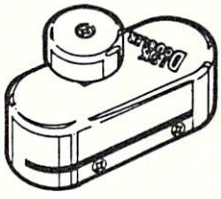

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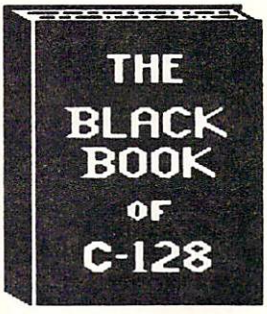

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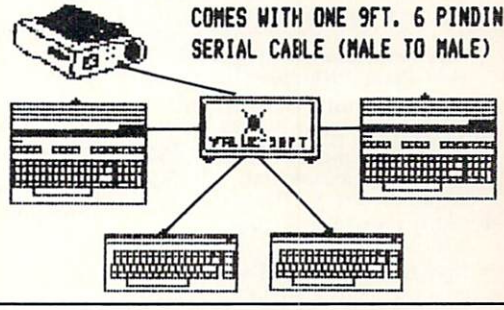

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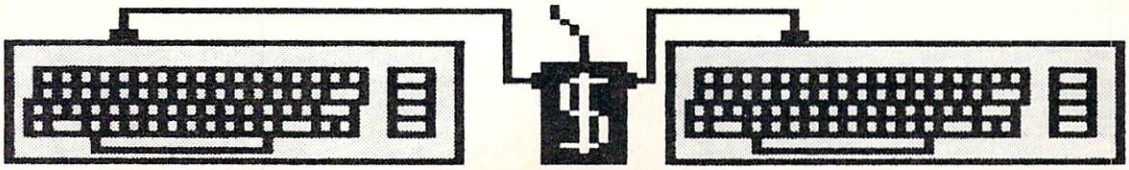

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C-40 Home Finance Organizer 1
C-41 Home Finance Organizer 2
C-42 Home Income Manager
C-43 Home Money Manager
C-44 Home Property Manager
C-46 Personal File Keeper
C-47 Personal Investment Manager
C-48 Family Tree
C-49 Electronic Scheduler
C-50 Pro Financial Organizer
C-51 Recipe Box
C-52 Tax Record Organizer

Education Series

C-53 Number Builder
C-54 Number Chaser
C-55 Hide & Seek
C-56 Picture This
C-57 Let's Count
C-58 Time Trucker
C-59 Fancy Face
C-60 Math Manor
C-61 Typing Tutor
C-62 Speed Reader

Electric Book Co.
Education Series

C-63 Why?
C-64 When?
C-65 The Three Bears
C-66 Gingerbread Man
C-67 Baby Animals
C-68 Hoppy the Curious Kangaroo
C-69 Wild Animals
C-70 Tom Thumb
C-71 I Was a Second Grade Werewolf
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A-11 Memory Quest
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A-15 Passport to London
A-16 Passport to Paris

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A-18 Financial Planner
A-19 General Ledger
A-20 Monthly Budgeter
A-21 Nutrition Monitor
A-22 Securities Portfolio
A-23 Recipe Box
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A-30 JWriter, Word Processor
A-31 Utility Master
A-32 Vital Data Keeper
A-33 Typing Tutor
A-34 Tax Record Organizer
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A-36 JBase

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A-37 Mr. Math
A-38 Speed Reading
A-39 Beginning Counting
A-40 Counting Skills
A-41 Addition I
A-42 Addition II
A-43 Addition III
A-44 Addition IV
A-45 Subtraction I
A-46 Subtraction II
A-47 Subtraction III
A-48 Multiplication I
A-49 Multiplication II
A-50 Multiplication III
A-51 Division I
A-52 Division II
A-53 Division III
A-54 Division IV

Electric Book Co.
Education Series

A-55 Why?
A-56 When?
A-57 The Three Bears
A-58 Gingerbread Man
A-59 Baby Animals
A-60 Hoppy the Curious Kangaroo
A-61 Wild Animals
A-62 Tom Thumb
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```
100 REM "STRINGIT" PUT M.C. ROUTINE IN A
CTIVE STRING WITHOUT DATA STATEMENT USE
110 :
120 GOTO170:REM JUMP PAST SUBROUTINE
130 :
140 FOR N=1 TO LEN(D0$) STEP4:MC$=MC$+CH
R$(VAL(MID$(D0$,N,3))):NEXT
150 FR=FRE(0):RETURN
160 :
170 D1$="165 020 072 165 021 072 032 253
 174 032 138 173 032 170 177 133 021"
180 D2$="132 020 032 019 166 165 095 133
 065 165 096 133 066 104 133 021 104"
190 D3$="133 020 056 165 065 233 001 133
 065 165 066 233 000 133 066 096"
200 D0$=D1$:GOSUB140:D0$=D2$:GOSUB140:D0
$=D3$:GOSUB140:END
210 :
220 REM A LINE LIKE THE FOLLOWING RESTOR
ES DATA POINTER TO SPECIFIED LINENUMBER
230 :
240 MC$=MC$:FR=FRE(0):TP=PEEK(51)+256*PE
EK(52):SYS TP,<LINENUMBER>
```

IT'S STILL RELATIVE

As most people are aware by now, the Commodore 128 has a "bug" in its ROM which prevents the pixel cursor from being offset, in a negative direction, relative to its previous location. You are supposed to be able to put a plus or minus sign in front of an X or Y coordinate in the BOX, CIRCLE, DRAW, LOCATE, PAINT, SSHAPE, and GSHAPE commands to move the pixel cursor relative to its last location. But, if you use a minus sign, an "ILLEGAL QUANTITY ERROR" is generated. However, there is an undocumented form of relative pixel cursor placement which will work with all of the above commands. (It is described in the *System Guide*, but only for option #3 of the MOVSPR command.) Whenever a coordinate is called for in the commands named above, you may substitute a distance from the current pixel location along a specified angle by separating the numbers with a semicolon instead of a comma. For example,

```
GRAPHIC 1,1:DRAW 1,45,100 TO 100;90 TO 1
30;310 TO 104;180 TO 120;90 TO 50;235 TO
144;270 TO 50;305 TO 106;90
```

will draw a very crude rendition of a sailboat. Experiment; I think you will find it to be a useful addition to your programming arsenal. —Rick Rothstein
Trenton, NJ

EXPRESS YOURSELF WITH RESTORE

According to the Commodore 128 *System Guide*, the RESTORE command can have a line number after it to determine which DATA statement is read next. What the *Guide* doesn't say is this line number need not be a simple numerical constant, but rather can be any valid mathematical expression! For example, consider

```
RESTORE 100 + 10 * EX
```

where EX is an expression composed of any correctly posed combination of string and numeric functions that equates to integer values. If EX=0, then the DATA statement at line 1000 would be RESTOREd; if EX=1, then line 1010 would be RESTOREd; and so on. As it turns out, the RENUMBER command will work correctly with these mathematical expressions provided the first value in the expression is a constant which represents a valid line number. In the above example, RENUMBER would change the constant 1000 to the same number that line 1000 becomes. However, RENUMBER will not look beyond the first constant it finds; so changing the line number increments will probably invalidate the RESTORE expression. —Rick Rothstein
Trenton, NJ

PRINT DOLLARS AND CENTS

Commodore 64 programmers do not have the handy PRINT USING command, one of the commonest tasks of which is to convert a numeric variable into a string for printing in dollars and cents format—a job that can be done quite nicely by this two-line subroutine:

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```
1000 R$=STR$(INT(Q*1000+(SGN(Q)*5))):L=L
EN(R$)
1010 R$="$"+LEFT$(R$,L-3)+"."+MID$(R$,L-
2,2):RETURN
```

Put the number in variable Q, do GOSUB 1000, and the formatted number is returned in string variable R$, ready for printing. The subroutine can handle any positive or negative number that contains (or that rounds to a dollars and cents figure which contains) no more than eight digits plus the decimal point. —C.C. Stalder
Waynesville, NC

COMSTOP

This IRQ routine stops the operating system for an indefinite amount of time dependent on the pressing and holding the Commodore key. This is useful if you don't have a printer (or do) and want to look at a program or directory listing. Just load *Comstop* and type SYS 828 and you are ready to continue. This routine cannot be relocated in the present form. —Stephen J. O'Connor
Lake In The Hills, IL

```
·90 REMSAVE"@0:COMSTOP",8:VERIFY"@0:COMST
 OP",8
·95 REM PROGRAM BY STEPHEN J. O'CONNOR
·100 FORI=828TO861:READA:CK=CK+A:POKEI,A:
 NEXT
·105 IFCK<>4152THENPRINT"[CLEAR][8"[RIGHT
 ]"][RVSON]ERROR IN DATA STATEMENTS":STOP
·110 SYS828:PRINT"[CLEAR][12"[RIGHT]"][RV
 SON]-COMSTOP ENABLED-"
·115 PRINT"[DOWN][10"[RIGHT]"]SYS 828 TO
 RE-ENABLE.":NEW
·120 DATA120,169,073,141,020,003
·125 DATA169,003,141,021,003,088
·130 DATA096,165,211,208,014,032
·135 DATA159,255,240,251,173,141
·140 DATA002,201,002,208,002,240
·145 DATA242,076,049,234
```


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WEDGE-O-MATIC

Ever want to bring up the directory without destroying what's already in Ol' Reliable's memory? Don't have a program that'll do this little goodie for you? Give *Wedge-o-Matic* a try. It's easy to use and works with both the 64 and VIC 20.

First load and run *Wedge-o-Matic*. Now you can load, save, and run all the programs you want (providing they don't POKE data into the cassette buffer). Whenever you want to view the directory, type SYS 828 and press RETURN. Bingo, the directory appears without launching your current program into oblivion. If you want to exit *Wedge-o-Matic* before it has finished listing the directory, press the STOP key.

As listed, *Wedge-o-Matic* works on the 64. If you're using a VIC 20, remove the REM in line 48 (just the REM statement, not the whole line). Now *Wedge-o-Matic* will automatically make the necessary POKE to become VIC 20 compatible.

—Buck Childress
Salem, OR 97309

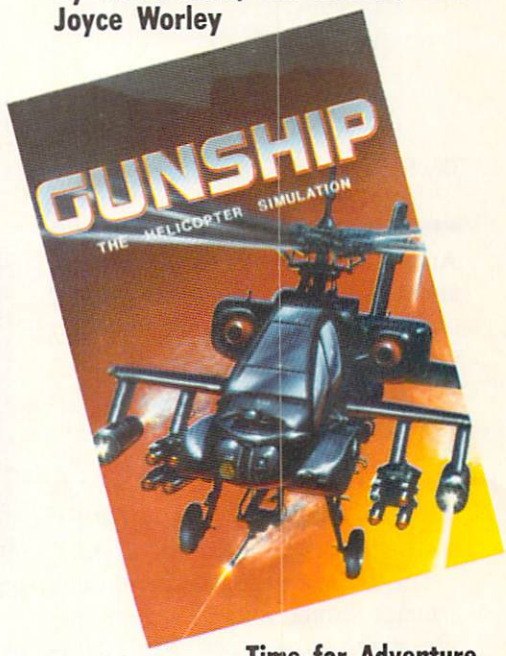
```
·10 PRINTCHR$(147)"LOADING":PRINT
·20 FORJ=828TO923:READA:POKEJ,A:X=X+A:NEX
 TJ
·30 IFX<>14168THENPRINT"ERROR IN DATA[3".
 "]":END
·40 REM POKE900,221
·50 PRINT"DATA OK":PRINT:PRINT"SYS 828 TO
  USE[3"."]":END
·60 DATA169,147,32,210,255,169,36,133,251
 ,169,5,162
·70 DATA8,160,0,32,186,255,169,1,162,251,
 160,0
·80 DATA32,189,255,32,192,255,162,5,32,19
 8,255,32
·90 DATA228,255,32,228,255,32,228,255,32,
 228,255,32
·100 DATA228,255,72,32,228,255,168,104,17
 0,165,144,240
·110 DATA8,32,204,255,169,5,76,195,255,15
 2,32,205
·120 DATA189,169,32,32,210,255,32,225,255
 ,240,234,32
·130 DATA228,255,208,243,169,13,32,210,25
 5,76,101,3
```

CHRISTMAS '86 ENTERTAINMENT SOFTWARE PREVIEW

These are the games we'll be giving and getting this holiday season.

Featured This Month:
Christmas '86 Preview 41
Murder on the Mississippi 44
GBA Championship Basketball (Two-on-Two) 45
Europe Ablaze 46
World Karate Championship 47
Oo-Topos 47
Super Bowl Sunday Expansion Disk #2 48

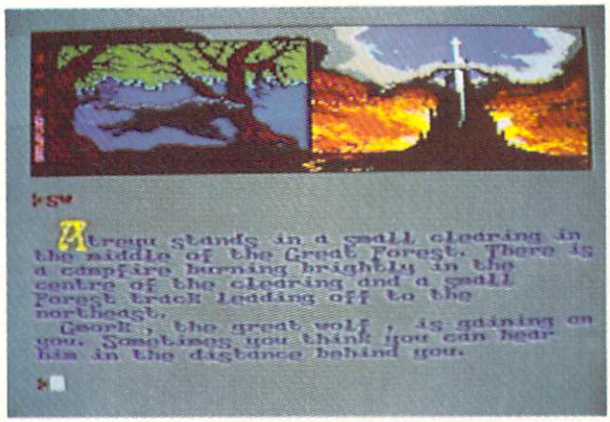
By Arnie Katz, Bill Kunkel, and Joyce Worley



The supply of new game and recreational software slowed to a trickle during the first half of 1986. Things are looking a lot brighter for this fall and winter, however. Publishers have stepped up their new program introductions in response to strong Commodore 64 and 128 sales.

There never seem to be enough entertainment programs for the Commodore. That makes the new crop, expected to reach stores in time for Christmas and Chanukah giving, especially welcome.

Some of the recommendations listed below have been mentioned in recent installments of *Scuttlebutt*; most are announced here for the first time. All should contribute to a festive holiday season.


A troop stands in a small clearing in the middle of the Great Forest. There is a campfire burning brightly in the centre of the clearing and a small forest track leading off to the northeast.
Geork, the great wolf, is gaining on you. Sometimes you think you can hear him in the distance behind you.

PartyWare *(top left) generates personalized banners, hats, cards, etc.*
READER SERVICE NO. 268

Gunship *(top right) simulates the peril-paved flight of an Apache copter*
READER SERVICE NO. 269

The NeverEnding Story *(bottom) teams kid-venturers with Falkor the dragon.*
READER SERVICE NO. 270

Time for Adventure

Fantasy role-playing games allow the computerist to create characters and guide them through a series of experiences. Although there's generally a plot which serves as a framework, there's usually a lot of room to wander, explore, and get into mischief. Among new fantasy role-play disks are two sequels to game-systems which made their debuts earlier this year.

Now *Alternate Reality* fans can find out what lurks beneath the city in *Alternate Reality: The Dungeon* (Intellicreations/Datasoft). The gamer can take high-level characters into a four-level labyrinth to fight monsters and gain fabulous treasures.

Bard's Tale II: The Arch-Mage's Tale (Electronic Arts) has seven cities and a new character class, the

Toy Shop *creates 20 working models.*
READER SERVICE NO. 271

Arch-Mage with a book of 30 incantations. Characters generated with the original program can continue their exploits here.

Fairlight (Mindscape, $29.95) is a three-dimensional role-playing fantasy game with breathtaking visuals. The beautiful kingdom has lost its magic. It can only be restored if a hero retrieves the Book of Light.

The literary quality of the prose is a major strong point of several text adventures coming soon. If an adventure game has nothing but text on the screen, let it always be as luminous as in *Thomas M. Disch's Amnesia* (Electronic Arts, $39.95). Science fiction author Disch worked closely with the Cognetics design team to produce a sprawling game with 4,000 different locations, including the entire New York City subway system. The plot is a search for the hero's own identity.

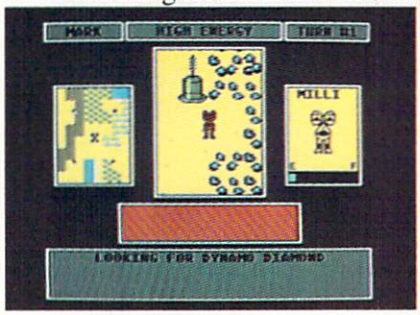
Portal (Activision) is finally nearing completion, according to the publisher. It is described as an icon-driven computer science fiction novel. Rob Swigart is the author.

The latest in the series of all-text computer novels which began with *Mindwheel* is *Breakers* (Broderbund-Synapse, $39.95). It's a complex science fiction story, and it is said to have a higher excitement level than a couple of the earlier titles.

Infocom's legion of devoted fans should be particularly pleased by the company's next trio of releases. The format remains the same, but the subject matter is more varied. *Trinity,* written by Brian Moriarty, is a time travel story. The adventurer must reshape history so an atom bomb does not destroy London.

Leather Goddesses of Phobos is a spicy satire of 1930s pulp science fiction by Steve Meretzky. The Leather Goddesses want to turn earth into a sexual playground, but you've got to stop them anyway. It's a sequel, of sorts, to *Starcross.*

Infocom hopes *Moonmist* will prove especially interesting to female players, because it has an ambience similar to the Nancy Drew books. The object is to find the castle ghost while searching for treasures. This introductory level game has four variations, each with different treasures, hiding places, and dangers.

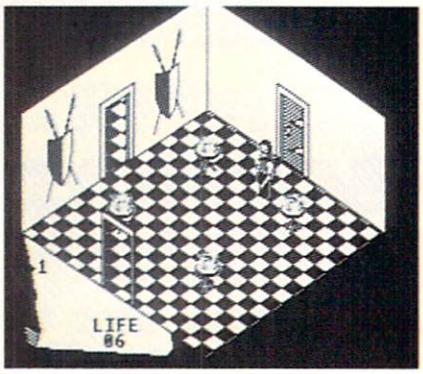


Scavenger Hunt *includes cards, board.*
READER SERVICE NO. 272

The Pawn (Firebird) features the most flexible and responsive parser ever included in a home computer adventure game. The illustrations for this fantasy adventure are equally outstanding. The same design outfit, Magnetic Scrolls, will shortly introduce an even more ambitious sequel called *Guild of Thieves,* which will appear for the Commodore sometime in 1987.

Hacker II: The Doomsday Papers (Activision) is Steve Cartwright's sequel to last year's hit adventure strategy game. This time, the government needs your help to avert disaster. The player uses the robots to break into a computer complex and get the evidence to stop a sinister scheme.

Murder Party (Electronic Arts) brings 1986's hottest parlor game craze to the home computer screen. It furnishes everything needed to host a murder party for up to seven people. The package includes invitations, clues, and complete instructions. A big advantage over similar, non-electronic products: *Murder Party* has variable culprits and clues for each play-session.



Fairlight: *3-D role-playing fantasy.*
READER SERVICE NO. 273

In *Gunslinger* (Intellicreations/Datasoft), a friend will hang in two days if you can't spring him from a Mexican jail. Meanwhile, the six Dalton brothers are out to get you in this wild west romp.

The NeverEnding Story (Intellicreations/Datasoft) is a kid-venture based on the movie and book of the same name. The goal is to save the land from the all-consuming Nothing and restore the empress with the aid of Falkor, the Luck Dragon.

Super Sports Simulations

Sports simulations are now second only to adventures in popularity among computer gamers. Both strategy and action are well-represented among titles which will reach store shelves by the holidays.

True Stat Baseball (SubLOGIC) is a statistical replay baseball game for one or two armchair managers. Among its unique features is a system of park effects. Balls which would be long outs in Dodger Stadium sail over the wall for home runs when you play in Yankee Stadium. Clever graphics even show the monuments located (until recently) out in centerfield in the House That Ruth Built.

Championship Baseball 1986 (Activision/Gamestar) is a revamped version of *Starleague Baseball*. The strong points of the original remain intact, but now there's a closeup view of the batter and pitcher on the right-hand side of the playscreen.

Fans of action-sports simulations should put *World Games* (Epyx) on their holiday "want" lists. In the great tradition of *Summer Games I and II* and *Winter Games*, up to eight computerists travel the globe and compete in eight exciting events.

MicroRing WWF Wrestling (Micro League Sports Association) is the working title of a statistically based wrestling simulation starring Hulk Hogan and a cast of colorful rule-breakers. One or two participants use the joystick to select holds from menus, which the program then depicts onscreen in full-color, digitized animated sequences.

Championship Wrestling (Epyx) is a joystick-activated mat game for one or two computerists. The grapplers, shown in modified overhead perspective, can apply approximately 20 holds from a clothesline to an atomic drop.

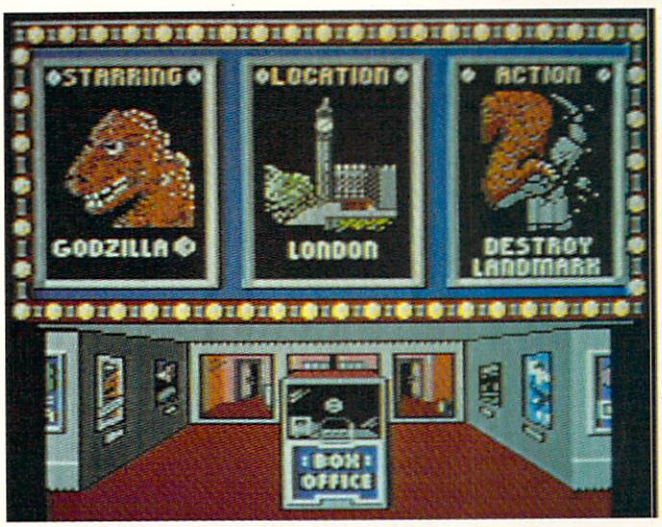
Don't laugh at the idea of a computer bowling title until you've rolled a few games of *10th Frame* (Access Software, $39.95). Up to eight keglers can enjoy this beautifully presented simulation. The gamer positions the onscreen bowler and determines the power of the swing.

Yie Ar Kung Fu (Intellicreations/Datasoft) is another entry in the martial arts sweepstakes. The onscreen fighter advances rank by rank from white belt to a final confrontation with a kung fu champion.

The first-person perspective in *Super Cycle* (Epyx) makes the player feel the full effect of the 180 mph scale speed as the bike banks into turns and sweeps past well-drawn roadside objects. The program contains progressively harder courses to test the driver's skill.

Games for Thinkers

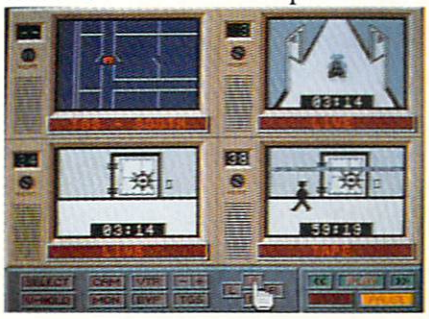
The Movie Monster Game (Epyx) brings *Crush, Crumble & Chomp* up to date. The gamer can become Godzilla, or one of five other monsters, and devastate one or more of the world's major cities. The three-quarter perspective graphics give the game a cinematic feel.



You too can be a silver screen star!* The Movie Monster Game *allows you to devastate cities in the guise of Godzilla or one of five other gigantic scaly things.
READER SERVICE NO. 274

Crosscheck (Intellicreations/Datasoft) is a crossword/*Scrabble*-type territorial battle. An onscreen die roll tells a player how long a word to build. The first contestant to construct a chain of words from the center of the board to the home base is the winner.

Scavenger Hunt (Electronic Arts) utilizes a gameboard and a deck of cards as well as the computer. This family-oriented program by Ozark Softscape should be good at a party or family gathering.



Hacker II: ***sequel to last year's hit.***
READER SERVICE NO. 275

221B Baker Street (Intellicreations/Datasoft) challenges the detection abilities of one to four sleuths with 30 cases set in Victorian London. This is the computer version of the already hugely popular boardgame. An extra disk with 30 new cases is already in preparation.

The popularity of games with a heavy strategic component has meant a corresponding drop in real-time action contests. Pure shoot-em-ups are going to be even more rare over the next six months, but the roster of forthcoming titles includes several disks which should please the joystick jockeys.

The airbrushlike graphics in *Starglider* (Firebird) gives this combat distinctive appearance. The player pilots the only surviving attack vehicle left on the planet after an invasion from outer space. Air-to-air and air-to-ground combat matches the computerist's craft against the Ergonians' enormous flagship, the Starglider.

Tracker (Firebird) is an action-strategy contest which puts the player in charge of the Tactical Remote Assault Corps. TRAC must penetrate the automatic defenses which ring a malfunctioning computer complex. The gamer can only actively control one of the eight attack robots at a time, so it takes some quick switches to prevent the defending Cycloid fighters from overwhelming a dormant one.

Mercenary: Escape from Targ (Intellicreations/Datasoft) is a cross between a flight simulator and an adventure. The protagonist has crash landed on a planet and can explore in the air, on the surface, and underground. Excitement awaits the onscreen hero everywhere.

Wars on the C-64

Some of the most intriguing game programs scheduled for release before New Year's march to a martial

cadence.

The player flies an Apache attack helicopter loaded with hellfire laser missiles, cannon, and rocket pods in *Gunship* (MicroProse, $34.95). Pilots seek out the enemy with laser range-finders. Day and night missions let the whirlybird face everything from guerillas to Soviet surface-to-air missiles.

The flip side of the situation depicted in *Silent Service* is the basis for *Destroyer Escort* (MicroProse). The mission is to protect unarmed flotillas of up to 39 ships as they ply the water routes between Britain and North America.

Battle of Britain/Battle for Midway (Firebird, $19.95) looks like an excellent value for armchair military strategists. One of the disk's two programs realistically simulates the titanic struggle between the RAF and the Luftwaffe, while the other makes the gamer the commander of the U.S. Pacific Fleet after Pearl Harbor.

Non-Game Entertainment

Don't wait until Christmas Day to give someone *Jingle Disk* (Hi Tech Expressions, $9.95). This cheery little item plays holiday songs and helps the computerist make personalized greeting cards.

PartyWare (Hi Tech Expressions, $14.95) is a two-disk product which composes banners, party hats, ribbons, place mats, place cards, invitations, notes, and greeting cards. It also has a party-planning checklist, game ideas, and a database which holds 60 names, addresses, birthdates, and so forth. The program can generate an animated message disk which the recipient can play on any Commodore 64. Hi Tech Expressions also offers *JollyWare*, special, festive printer paper.

Walt Disney Card & Party Shop (Bantam Electronic Publishing, $34.95) makes it easy to design stationery and greeting cards. More than 100 special graphics and 45 decorations add a special Disney touch. The art tool box allows the craftsperson to resize, transpose, and otherwise manipulate the images.

Certificate Maker (Springboard, $49.95) has a bank of 200 certificates which the user can customize and print. Border, message, and signature line are all modifiable.

Walt Disney Comic Strip Maker (Bantam Electronic Publishing, $34.95) allows young computerists to create three-panel strips which can be printed out in either color or black and white. The user selects characters, objects, backgrounds, and balloons from the disk's databanks, then puts dialogue in the word balloons.

Video Shop (Intellicreations/Datasoft), an easy-to-use tool for videophiles, provides a method for the speedy production of customized titles and introductions for homemade videotapes.

Toy Shop (Broderbund, $59.95) is a whole box of goodies on a mylar platter. It creates 20 working models and toys. Toys are customized on the screen, printed out, and attached to adhesive cardboard.

Final Thoughts

Of course, manufacturers' schedules aren't carved in stone. Development and production problems will delay a few disks.

By the same token, some unexpected releases are certain to jump into the spotlight. Competition-conscious publishers don't want to tip all their plans in advance.

In fact, computer stores will have most of the titles discussed here by the time Santa Claus is ringing his bell on every street corner. It looks like the season to be jolly for those who love entertainment software. □

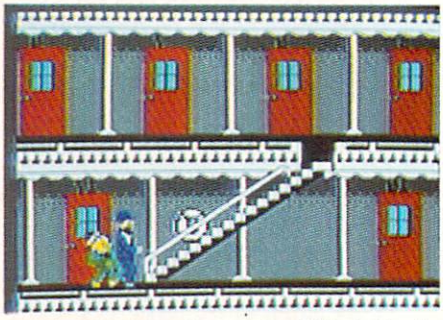
MURDER ON THE MISSISSIPPI

Activision
Commodore 64
Disk; $34.95

Mayhem and mystery are passengers on the Delta Princess as it rolls down Old Man River from St. Louis to New Orleans. Sir Charles Foxworth, the renowned British sleuth, is aboard the sternwheeler, along with his trusted gentleman's man, Regis Phelps. When murder most foul is discovered, it's up to the gamer, as Sir Charles, to locate the body, question the passengers and crew, gather clues, and solve the crime.

The setting of this delightful melodrama is so appealing that gamers might be tempted to forego the mystery, and just stroll the decks of the beautiful riverboat. The Delta Princess is a quadruple-deck palace, complete with cabins, wheelhouse, salon, and staterooms. The sound of the lapping waters is realistic, and the colorful flag waving in the breeze adds a lovely note to the scene.

Sir Charles, accompanied by Regis, starts the game by wandering freely from deck to deck. But even as he meanders through the ship, poking around in unlocked rooms, someone is committing murder. Soon, if he looks carefully, the body turns up and the mystery really begins.



Solve the **Murder on the Mississippi.**
READER SERVICE NO. 276

The titled detective must talk with the eight suspects again and again as he cross-examines testimony and compares stories.

Created by Adam Bellin, *Murder on the Mississippi* boasts what may be the best system ever devised for computer adventuring. The gamer

GBA Championship Basketball: *¾ view.*
READER SERVICE NO. 277

employs the joystick to manipulate a series of onscreen menus. Available options permit investigation, questioning of suspects, and even automatic note-taking.

The sleuth uses joystick-selectable menus to talk to each suspect about him/herself, the victim, and other people on board. The gamer chooses a phrase like "Tell me about...", and then selects a picture of the character under investigation.

The answers become the basis of Sir Charles' notes, in one of the most unusual features of the game. The gamer points to words in the suspect's testimony with a hand-shaped cursor. Anything marked in this manner is entered on Charles' notepad. The detective can keep one line of information out of each statement and may accumulate up to three pages of notes about each person.

The notes are parts of a story which, once assembled, leads Sir Charles to the killer. If the computerist accuses an innocent, he may get Sir Charles tossed off the boat. And if the boat reaches New Orleans before the mystery is solved, the murderer gets away free.

The program provides the sleuth with quite a bit of assistance. Physical evidence is scattered around the boat, including a passkey to the locked rooms and oily rags used to clean a gun. Regis pockets the evidence on request, or it can be stored in Sir Charles' steamer trunk in his cabin. Some items must be searched very closely to extract the clues, so Charles has an examining table for eyeballing things in detail.

Charles also collects information by walking up to objects in each room and investigating them. However, it is sometimes difficult to get Charles next to the item the gamer wants to study, particularly if there are obstacles in the way.

The elegance of the setting makes the mystery more enjoyable. Every C-64 user should be thrilled by the handsome sternwheeler, the lovely staterooms and salons, and the cleverly drawn, cartoon-style characters who people the riverboat. The game is further enhanced by Ed Bogas' original music. The cheerful themes brighten Sir Charles' deck strolls, and enliven each new scene.

Murder on the Mississippi is pretty to look at, but far from simple to solve. This is one cruise you won't want to miss.

Activision, 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

—Joyce Worley

GBA CHAMPIONSHIP BASKETBALL (TWO-ON-TWO)

Gamestar
Commodore 64
Disk; $34.95

We moved across half-court, and I pulled back a second to steal a glimpse of the clock. Less than a minute left.

My presence immediately drew the attention of a Condor defender, while his partner covered my teammate, Magic Lyndon.

Abruptly, I broke for the net, rolling slightly to the right and inside the defender. At the top of the key I stopped, spun, and lofted the roundball in a smooth arc toward the hoop.

The shot hit the rim, but Magic, who was skywalking in the neighborhood, cleanly snatched the rebound. He swallowed up the ball and disappeared under the swarming Condor defenders.

An instant later, the ball came blasting out of the pileup and caught me in the hands—a picture perfect pass. The Condors instantly broke off mugging the Magic Man and made a beeline for yours truly.

As they reached me, I found Magic with a pinpoint pass. In the open now, he took two steps, then rattled the white string with a tomahawk jam.

The wonderful thing about the above description of action from *GBA Championship Basketball (Two-on-Two)* is that it contains no elaboration, embroidery, or poetic license. That is how the game actually *plays,* and this vignette hardly incorporates half the features of the program.

Like most Gamestar titles, *GBA Championship Basketball* offers arcade-style action with strategic overtones. Users "design" their player surrogates by assigning numerical values for each skill area. A total of eight points is divided between inside and outside shooting ability. Another eight are apportioned between dribbling and stealing, and a final eight between quickness and jumping.

In one-player games, or two-player, head-to-head contests, a draft is held and the user selects a champ to comprise the other half of his team. The 10 available players are described in the documentation, but each is clearly based on an actual NBA all-star ("Magic" Lyndon, Elgin Cutter, Kareem Ungrin, etc., with surnames taken from members of the Gamestar design group).

With two gamers, *Two-on-Two* is played either head-to-head or with both players on the same team against a computer-coached tandem. The latter is an especially refreshing experience since the players can call to one another and set up as they would on

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an actual court.

Two-on-Two is a full-court basketball simulation with half the court on-screen at any given time. Once possession changes, the computer controls the offense as it moves to mid-court. This period is allotted to play-calling, as the computerists move joysticks to select one of four offensive/defensive setups. Once the ball passes mid-court, control returns to the player on offense.

The simulation also includes fouls, traveling, and three-second violations. Once a team draws five fouls, it's free throw time. The clock is set at 24 seconds, and play elements include stealing, shot blocking, time-outs, and, of course, rebounding.

GBA Championship Basketball (Two-on-Two) features excellent graphics which display the court at a three-quarters perspective, as viewed from above center-court.

The game has only one serious flaw—the clock isn't visible during the pause or time out mode. As a result, the only way to check the time is to look from the action on the court up to the clock and back again. In an actual game, players can at least see the clock during time outs!

No review of a game subtitled *Two-on-Two* would be complete without a reference to the all-time computer hoop classic, Electronic Arts' *One-on-One*. Unlike that program, *Two-on-Two* does not let users control computerized simulacra of real NBA superstars—those players are strictly computer-guided in *Two-on-Two*. Instead, its strength lies in the level of strategy two-man teams create.

Games are part of a League context. The user contests in any of four five-team divisions. After each game, the results and subsequent standings are presented in a "sports page" format.

There's a "practice" mode and a regular game format, but period length is not programmable. Difficulty is determined by the division in which you play.

Documentation is first-rate, with complete team and player ratings, shooting percentages, and tactical tips.

Sports and action game fans will absolutely love *GBA Championship Basketball*, the first C-64 roundball simulation to go beyond the schoolyard and explore the possibilities of team play.

Gamestar/Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043 (phone: 415-960-0410).

—Bill Kunkel

EUROPE ABLAZE

Strategic Studies Group
Commodore 64
Disk; $50.00

If it is possible for a military simulation to be too good, too detailed, too versatile—then *Europe Ablaze* probably approaches that plateau. But for those who constantly reach for new levels of complexity and strategy, for those who want to expand and enrich their wargaming, *Europe Ablaze* is a must.

Briefly, *Europe Ablaze* recreates the air war over Europe over a five-year span. It also goes beyond the stage of "Which side you wanna be, good guys or bad guys?" A player may fill any of 12 different jobs. Each side has a Commander-in-Chief, supported by five lesser commands.

The computer handles all the jobs not taken by a human. In consequence, two players can work in tandem against the computer, as well as compete against each other head to head.

One side is the Germans, trying to bomb England into submission. The other side is the American and British forces, trying to stave off the attack and launch a counteroffensive.

The game includes three different scenarios. "Their Finest Hour," Aug. 10-Sept. 4, 1940, commonly known as The Battle of Britain, is the basis of the first. The second is "Enemy Coast Ahead," July 23-Aug. 20, 1943, which involves raids by the Allies against Germany. The third is "Piercing The Reich," Feb. 3-26, 1944, where it was the Allies' turn to try to bomb Germany into surrender.

It's impossible to find serious flaws. The most this reviewer can offer is a caution: a simulation of such scope can't help but overwhelm a novice gamer or one with limited knowledge and/or experience with air battle titles.

To SSG's credit, *Europe Ablaze* comes packaged with extensive playing aids and a friendly rulebook. It's only 20 pages, mostly due to the program's easy-to-use menu-driven structure. The authors wanted the novice to be able to play at first attempt. Winning is another matter.

The instruction book includes tutorials for both the positions of C in C and Air Fleet Commander. It takes the computerist through a sample game, prompting the right menu choice to make at each step.

As C in C, the gamer decides what priority to assign to each command, then allocates missions and assigns an activity level. At the Air Fleet Commander's post, the commander must dispatch individual planes to the tasks created by Allied action.

All orders are entered through the keyboard. Most of the pertinent information is at the player's fingertips. The trick is more in knowing what data to request and at what time. Conditions for victory determination

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differ for each side. The force with the highest point total of the C in Cs wins that scenario, and the Air Fleet Commander with the highest total is the overall winner.

The gaming aids are a colorful laminated sheet with all the game menus and two full-color maps. One shows the coast of Germany and the British Isles for Scenario One. The second map depicts Germany with part of Britain for Scenarios Two and Three.

The most exciting feature of *Europe Ablaze* is the Game Design Kit. It allows users to create their own scenarios and play a fourth scenario described in the rulebook, which is set in the Mediterranean Theater in March of 1944.

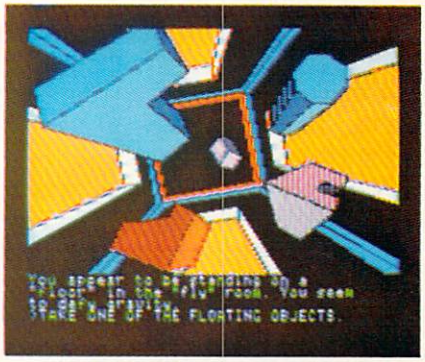
The kit includes a 42 × 36 hex grid, 24 aircraft types, 255 squadrons, 127 airbases, 63 city centers (with population, industry, communications, and ports), 63 radar stations, 63 shipping lanes, 63 flak units, identity and briefing routines, cursor selection, national doctrine, weather creation, and victory determination. If this game doesn't become one of the most often booted in your software library, you're not a true wargamer.

The 24-page Design Manual is a step-by-step guide to scenario creation. Not originally meant to be included with the game, the design kit was only created to make it easier for the game's designers to communicate with each other. But it certainly adds value to a steeply priced title.

Europe Ablaze will provide endless hours of enjoyment for dedicated wargamers. It stands as the best computer military simulation published so far in terms of historical accuracy and playability.

Electronic Arts, 1820 Gateway Drive, San Mateo, CA 94404 (phone: 415-571-7171). ***—Rick Teverbaugh***

World Karate Championship: ***a kick.***
READER SERVICE NO. 278



Oo-Topos: ***interactive sci-fi novel.***
READER SERVICE NO. 279

WORLD KARATE CHAMPIONSHIP

Epyx
Commodore 64
Disk; $25-$35

World Karate Championship is yet another home variant of Data East's coin-op arcade hit, *Karate Champ.* This version is notable for crisp programming, excellent animation, and an atmospheric soundtrack.

Like other contests based on that classic, *World Karate Championship* displays two combatants in side perspective while an onscreen karate master rates knockdowns and declares the winner of each round.

The fighters are controlled by joystick, and perform 11 different maneuvers from either direction. Fighters block kicks and punches automatically when moved backwards. Combatants leap, throw leg sweeps, deliver three kinds of punches and five types of kicks, and can somersault forwards or backwards.

In between rounds, special tests are staged in order to advance to the next level. These challenges include breaking a stack of ten boards with your head and avoiding a fusillade of spears and knives.

The sounds, musical background, and visuals on *World Karate Championship* are striking. Before each game, the user opts to begin the contest in Egypt or Australia. Each subsequent round moves to a new locale, from New York City to Mt. Fuji. These beautifully painted settings provide *World Karate Championship* with invigorating backdrops.

The musical score is appropriately Eastern, with the subtly dissonant yet haunting twang of Oriental music accompanying the smacks, thumps, and kicks of martial combat.

Documentation is excellent, but it will still take most users several hours of play to develop true mastery over the extensive repertoire of moves.

World Karate Championship may not win any awards for innovation, but in terms of delivering a quality product, this Epyx program gets a black belt.

Epyx, 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700).

—Bill Kunkel

OO-TOPOS

Polarware/Penguin Software
Commodore 64
Disk; $17.95

Michael Berlyn's *Oo-Topos* was first published by Sentient Software for the Apple II+ back in 1981. It was one of the earliest attempts to produce an interactive science fiction novel on computer. Berlyn, a genuine SF author ("Crystal Phoenix," "The Integrated Man"), proved the ideal man for the job, and *Oo-Topos* became a cult classic.

Now Michael and his wife Muffy have updated their classic adventure to interface with the Polarware's "Comprehend" graphic novel format. Raimund Redlich and Brian Poff added some fantastic illustrations, and the whole process breathed new life into an old favorite.

The gamer guides an Astro Mega Class, Tachyon Drive Spacecraft on a vital mission (delivering a compound to neutralize the deadly "power transfusion waste" threatening the earth). The drama heightens when a tractor beam grabs and forces the craft down on the hostile world Oo-Topos. On the surface, nasty locals overpower and imprison the pilot on board.

The adventurer must escape the cabin, regain control of the ship, and complete the mission.

The graphics are excellent, possessing a comic book vitality which is especially effective in the rendering of high-tech machinery. As much of the game is set on board a spacecraft, this is quite relevant.

Oo-Topos works very well with the Comprehend system. The action moves smoothly, there are few dead spots, and the player experiences a minimum of frustration at being unable to interface with the program. The only flaw is the parser's inability to handle uppercase letters. It is also disarming that graphic changes are done with a great flash, during which the entire screen goes black.

The documentation is extensive and well-presented. While there's plenty of extras to add context (including a letter from the President, a list of mission codes, and the operator manual for your ship), there's also a detailed explanation of the nuts-and-bolts—how to load, tips for communicating via Comprehend, and a lecture on the importance of mapping.

It's hard to know if there are many older games which could stand up under this type of modernization, but *Oo-Topos* comes through with flying colors. It's a pleasure to see its gripping story dressed up in the latest style adventure game system.

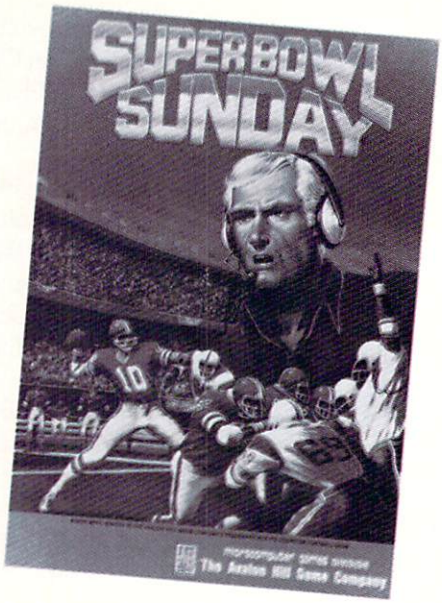
Polarware/Penguin, 830 Fourth Ave., Geneva, IL 60134 (phone: 312-232-1984). *—Bill Kunkel*

SUPER BOWL SUNDAY EXPANSION DISK #2

Avalon Hill
Commodore 64
Disk; $20.00

Graphics, breadth of play-calling options, and statistical accuracy make *Super Bowl Sunday* the outstanding statistical replay football program in the home computer field. Its legion of fans have clamored for additional teams since the title first appeared in 1985.

The Avalon Hill Game Company is now addressing this market for supplementary disks. The company, which previously published a disk based on the complete 1984-1985 National Football League season, now offers a collection of 12 more outstanding pigskin matchups, some of which occurred prior to the dawn of the Super Bowl era. Naturally, the 24 teams can be matched against each other in any desired combination, or pitted against squads contained on other *Super Bowl Sunday* disks.



Disk #2 offers 12 high-powered teams.
READER SERVICE NO. 108

Matchups included on the disk are Detroit-Cleveland, 1953; Baltimore-New York, 1958; Buffalo-Cleveland, 1964; Green Bay-Oakland, 1967; Kansas City-Minnesota, 1969; Dallas-Miami, 1971; Miami-Washington, 1972; Pittsburgh-Minnesota, 1974; Pittsburgh-Dallas, 1975; Oakland-Minnesota, 1976; and Dallas-Denver, 1977. The simulation of the older teams isn't perfect, primarily because football itself has mutated during the intervening years, but all these high-powered clubs are fun to coach and offer a pleasing variety of offensive and defensive weapons.

Pigskin partisans can only hope that the next expansion module will be a disk which facilitates player swaps among teams. Just think of the fun of fielding a squad with Joe Montana handing off to Jim Brown and Frank Gifford!

Avalon Hill, 4517 Harford Rd., Baltimore, MD 21214 (phone: 301-254-9200). *—Arnie Katz*

Reviewed next month:

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- **Psi 5 Trading Co.**
- **Super Cycle**
- **Frankie Goes to Hollywood**

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128 TO 64 AUTOBOOT

By Daryl Marietta Jr.

From time to time, you Commodore 128 owners have probably needed to run a C-64 program or two. However, upon turning on the machine, you may at times have forgotten to hold down the COMMODORE key to go into 64 mode, and had to either switch it manually or reset the computer and start over. Or there may have been other times when you wished you could have the machine autoboot a 64 program when turned on by a timer. Now these problems can be solved by installing the *128 to 64 Autoboot* routines on your disks.

Most 128 users already know that the machine can autoload and run a 128 program in 128 mode. The only problem is keeping a program running after switching modes. This is accomplished by setting a few key bytes to certain values in order to trick the 64 mode into thinking that a cartridge is plugged in.

The 128, upon power-up or resetting, checks for an autoboot by reading the disk at track 1, sector 0. It then prints the boot message found on the disk and loads a binary file into memory. This contains the code to make the 64 mode autoboot. The 128 then jumps into 64 mode, initializes for 64 mode, and loads the first program on the disk. Control is then passed back to the BASIC interpreter. If the first file on the disk is a 64 autorun program (which is the first file on many 64 owners' disks), the 64 continues to load its program as if you had typed LOAD":*",8,1 (RETURN).

To use the *128 to 64 Autoboot*, enter the 128-64.BAS listing on page 119. When you run this it creates the disk file 128-64.BIN. This is the only file you have to put on the autoboot disk. You can then set the 128's autoboot sector with the 1-0.BAS listing on page 120. The program asks for the boot message, which can contain control characters, and you terminate the input by using the back arrow key.

The *128 to 64 Autoboot* also works on commercial software, as long as the program does not use the 128 boot sector and allows you to put an extra file on the disk. □

SEE PROGRAM LISTINGS ON PAGE 119

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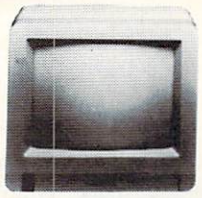

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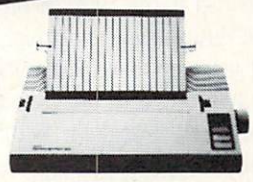

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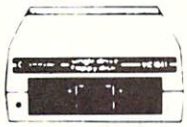

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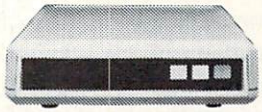

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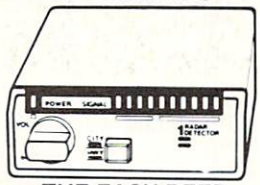

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QUICK CHANGE

For the C-64

By Buck Childress

After slaving over the computer for a seeming eternity to complete your latest program, you've discovered that several dozen lines need to be changed. Gremlins must be crawling around inside your 64, because at every opportunity *it* managed to type PIRNT instead of PRINT. And, to top it off, you're beginning to notice that your lines of data have the number 86 all over the place. You know it was supposed to be 96. Those darn gremlins. Now you'll have to spend another eternity finding and changing all of *their* mistakes. Well, it could be worse. At least you don't have a splitting headache—yet. But, somehow, you know one is on the horizon. Wouldn't it be nice if you could just take two aspirins and call the computer in the morning? Better yet, how about telling ol' Reliable what to change and letting *it* do the work?

Quick Change automatically changes anything you want, from numbers and strings to command words and graphics. Virtually anything in your BASIC program can be changed quickly and easily with *Quick Change*. Just tell *Quick Change* what to change, give the range of lines, and presto...the swap is made. You can use *Quick Change* to erase unwanted items as well.

After saving a copy of *Quick Change,* run it. The loader POKEs the machine language data into memory and checks for errors. If none are found, it's ready to use. Now load the program you want to change.

Quick Change can be switched on and off by typing SYS 50000 and pressing RETURN. The first SYS switches it on, the second switches it off, etc. A message will let you know whether it's on or off. It's a good idea to leave *Quick Change* off while you load, save, or run a program.

When you're ready to start making changes, switch *Quick Change* on. To use *Quick Change*, press any letter key (A-Z), then RETURN. (This is faster and easier than having to type a SYS number every time you want to change something.)

Quick Change asks for the old entry. You can enter up to 26 characters. They can be anything, including cursor control keys, function keys, and keyboard graphics. After you've answered and pressed RETURN, you'll be asked for the new entry. It, too, can be anything, up to 26 characters long. If you're using *Quick Change* to erase the old entry, don't give a new entry. Just press the RETURN key. "ERASE" will appear, verifying this choice.

Next you'll be asked to enter the range of lines you want the change to occur in. This is done in the same manner as when you LIST a program. For example, if you want the changes to take place through line 200, you would enter

```
-200
```

Changes from 100 to 350 would be entered

```
100-350
```

and changes from 500 to the end of your program would be like so:

```
500-
```

If for some reason you only want to change one line, say, 400, enter it like this:

```
400-400
```

Should you want the change to take place throughout the entire program, just press RETURN without entering anything.

If you make a mistake while answering a prompt, press the DELETE key. Pressing it again will take you to the previous prompt.

Quick Change is in the NORMAL mode when you first enter it. In this mode it only changes (or erases) entries that are not part of DATA or REM statements or contained in quotes. As an example, if you were changing PRINT to INPUT, it would be changed from this:

```
100 PRINT "PLEASE PRINT YOUR NAME"
```

to this:

```
100 INPUT "PLEASE PRINT YOUR NAME"
```

Pressing the CONTROL and N keys at the same time will return you to the NORMAL mode if you inadvertently switch to another.

If you want to change entries contained in quotes—including cursor control keys, function keys, and keyboard graphics—press the CONTROL and Q keys. Only items within quotation marks will be changed. Our example would be changed from this:

```
100 PRINT "PLEASE PRINT YOUR NAME"
```

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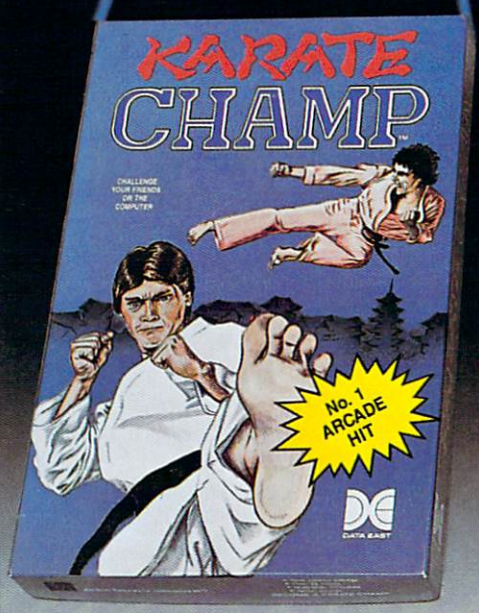

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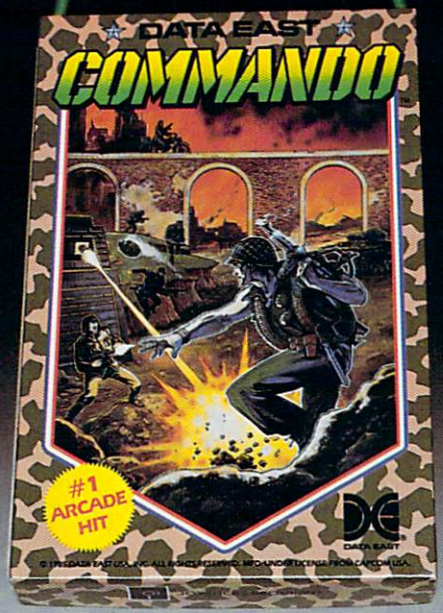

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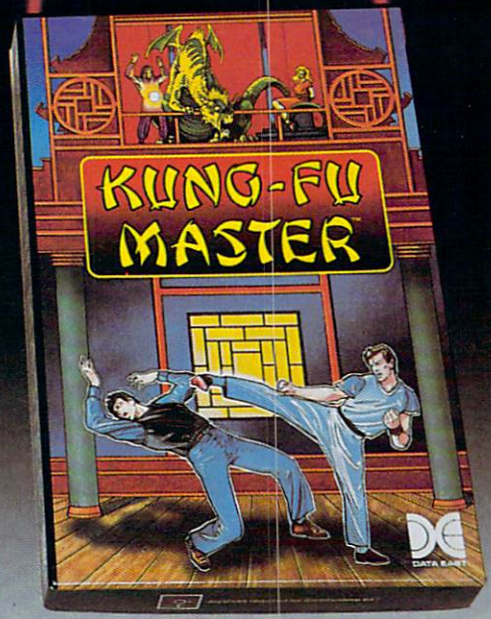

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to this:

```
100 PRINT "PLEASE INPUT YOUR NAME"
```

CONTROL and D enters the DATA mode. Now only DATA items can be changed. So, if you wanted to change data number 123 to 169,

```
200 DATA 123
```

would now be

```
200 DATA 169
```

Lines such as

```
150 PRINT 123
```

would remain unchanged.

The same is true for string data. If you ask *Quick Change* to change ABC to CBA,

```
210 DATA ABC
```

becomes

```
210 DATA CBA
```

Lines like

```
160 PRINT ABC
```

remain unscathed.

The REM mode works like the DATA mode. The difference is that only REM items can be changed. CONTROL and R brings you here.

The ALL mode is just what its name implies. It changes all occurrences of the chosen victim. CONTROL and A does the job. In the ALL mode a command to change PRINT to INPUT will change it everywhere. These lines:

```
100 PRINT "PLEASE PRINT YOUR NAME"
110 DATA PLEASE,PRINT,YOUR,NAME
120 REM "PLEASE PRINT YOUR NAME"
```

will be changed to

```
100 INPUT "PLEASE INPUT YOUR NAME"
110 DATA PLEASE,INPUT,YOUR,NAME
120 REM "PLEASE INPUT YOUR NAME"
```

Erasing is done exactly like changing. Choose the appropriate mode and whoosh...the unwanted item is zapped from the program. Suppose you wanted to eliminate "YOUR NAME" (not yours personally) from the above example. Choose the QUOTE mode and answer the OLD ENTRY? prompt with YOUR NAME, then press RETURN. Without answering the NEW ENTRY? prompt, press RETURN again, and

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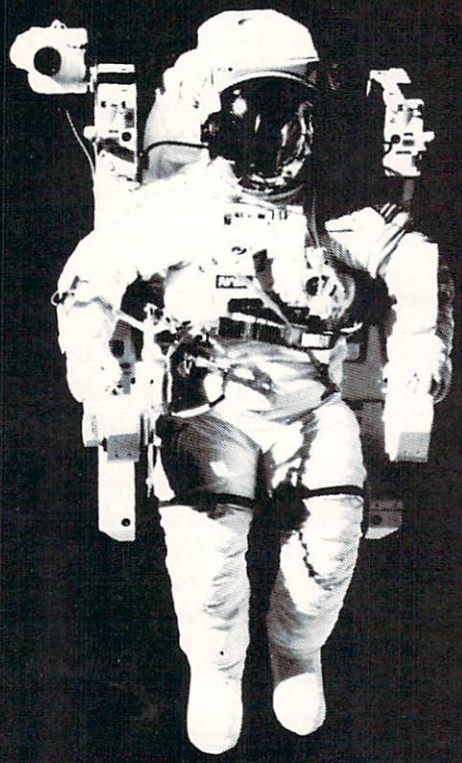

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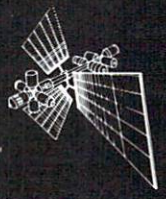

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```
100 PRINT "PLEASE PRINT YOUR NAME"
```

becomes

```
100 PRINT "PLEASE PRINT"
```

The mode you're currently in appears at the top of your screen. You can switch modes while you are answering the prompts. The various modes and their appropriate keys are listed on the screen.

Whether you're changing or erasing, remember to be accurate about defining the item. Suppose you want to change the data numbers 129 to 169. If you answer the OLD ENTRY? prompt with 2, and the NEW ENTRY? prompt with 6, every 2 in the data range you specified will be changed to a 6, whether it's 2, 22, or 92. This can easily be avoided by answering the OLD ENTRY? prompt with 129, and the NEW ENTRY? prompt with 169. As another example, if you answer the OLD ENTRY? prompt with REM and the NEW ENTRY? prompt with DATA, the following will result:

```
100 PRINT "REMEMBER TO CHANGE THE REM LI
NES"
```

will be changed to

```
100 PRINT "DATAEMBER TO CHANGE THE DATA
LINES"
```

Be specific. Answer the OLD ENTRY? prompt with THE REM or REM LINES and the NEW ENTRY? prompt with THE DATA or DATA LINES. You'll get the desired result:

```
100 PRINT "REMEMBER TO CHANGE THE DATA L
INES"
```

This becomes second nature with very little practice.

After you've answered the prompts, the screen clears and *Quick Change* displays all your answers in quotes so you can see exactly what it will be looking for, including spacing, etc. *Quick Change* also displays what it intends to do, along with the message "ARE YOU SURE? (Y/N)". Press Y for yes, or N if you're having second thoughts.

When changing a line, *Quick Change* doesn't allow excessive length. For example, if you decide to change REM to PRINT and, as a result, one of the lines will exceed 80 characters, *Quick Change* stops and displays the excessively long line. It also lists the line as it currently appears in the program so that you can make whatever corrections you might want.

Quick Change can be brought to a halt at any time by pressing the STOP key. To reuse *Quick Change,* press any letter key (A-Z), then RETURN.

Experiment with *Quick Change.* It's simple to use and zaps those gremlins fast. □

SEE PROGRAM LISTING ON PAGE 113

DVORAK KEYBOARD

For the C-64 and C-128

By Jim Partin

If you'd like to switch your C-64's or C-128's keyboard from the standard QWERTY to the more efficient Dvorak layout, endure the old method long enough to enter *Dvorak Keyboard.* The programs use a software method to activate the Dvorak keyboard; no hardware change is necessary.

Versions are included for the C-128 (in 128 mode) and the C-64 (or 128 in 64 mode). The programs don't use machine language wedges to implement the Dvorak layout, but modify the Kernal keyboard decode tables. Because of this, the new layout will work with a large number of programs provided the programs don't A) use the RAM that holds the new Dvorak layout or B) alter the memory locations that allow the alternate keyboard layouts to exist. While most public domain or magazine published programs will work, many commercial programs will not work. Cartridges such as the Epyx *Fast Load* may also have to be disabled to work with the new layout. Refer to the illustration for the new Dvorak keyboard layout implemented by the programs. Also, be sure to save the version of the program you type, as both program versions erase themselves after activating the new Dvorak layout.

Some final safety notes are necessary before using the programs. Keep in mind that while the RUN STOP/RESTORE combination will reset the C-64 to its normal keyboard layout, the same isn't true for the C-128. If you activate the Dvorak keyboard mode on the 128 and wish to return to QWERTY mode, just hold down the RUN STOP key and hit the side reset button. When you are dumped into the monitor, hit 'X' and RETURN. If you do accidentally hit RUN STOP/RESTORE on the 64 and want to return to Dvorak mode without rerunning the program, you can simply type POKE1,53 and press <RETURN>.

With some imagination, you can figure out a way to make Dvorak keycaps for your C-64 keys. Brown masking tape is best, since it will lift off without a fight if you elect to revert to QWERT.

The Dvorak layout is becoming more popular all the time. I hope these programs will help you get a taste of the future of computer keyboards. □

SEE PROGRAM LISTINGS ON PAGE 127

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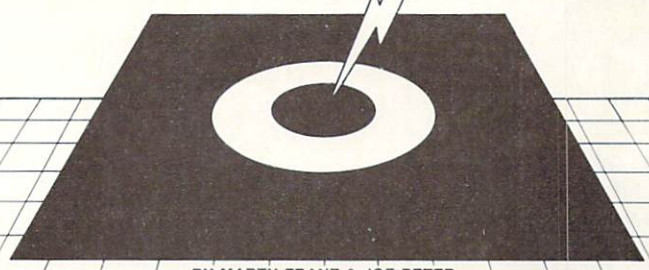

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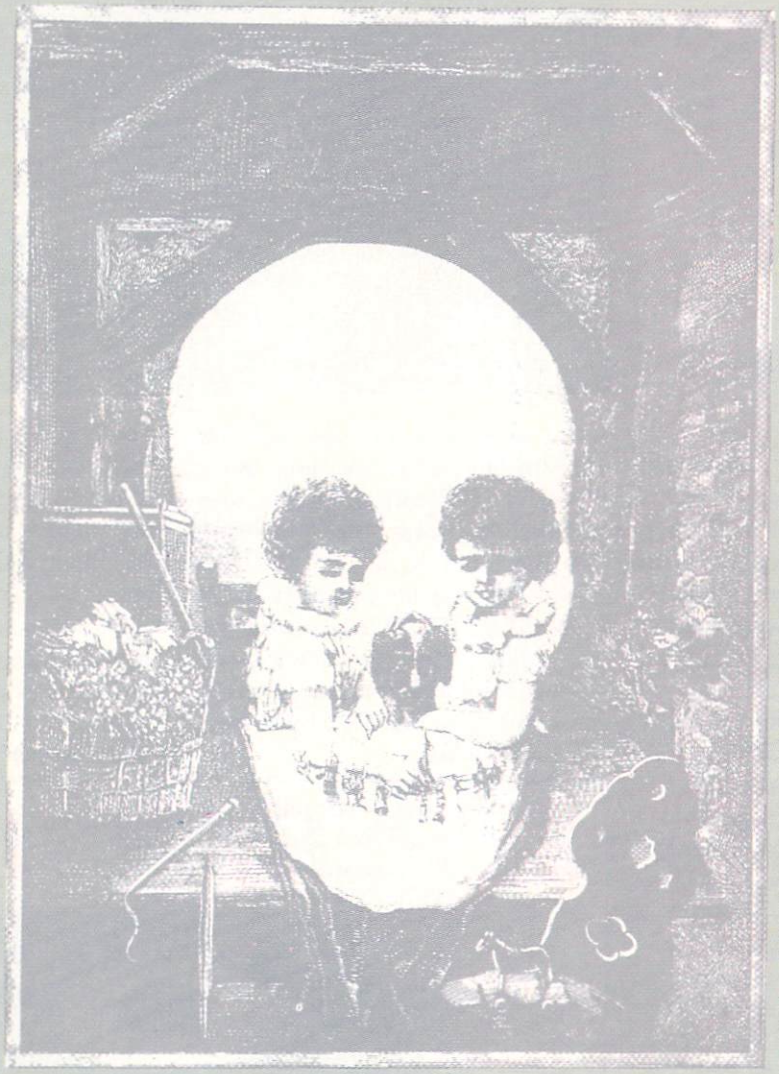

BY CLEVELAND M. BLAKEMORE

Sarnoth was once a happy, prosperous land, a country of mirth and joy where the sun shone year-round. When the new king inherited the throne, he hoped his rule would be as easy and peaceful as his father's reign before him. In the two hundredth year since the fall of Lemuria, the bad omens began. Dogs began speaking in tongues right in the royal court. The full moon seemed to burn ashen red for weeks. Babies slept fitfully, and the kingdom was plagued by oversized serpents which surfaced from out of nowhere and made off with whole cattle.

One day, while the king was arguing with his counselors in court over the source of the blight that was upon the land, there arose a massive black cloudfront that moved over the kingdom and seemed to fix itself over the castle. The people trembled with terror and many locked themselves inside their houses.

In the midst of the shifting darkness over the Castle Sarnoth, slithering shapes moved up the royal road, over the moat and into the castle. Guards rushed into the courtyard to battle with the shadowy figures, seeking to protect the king, and their screams were the only indicator that they survived for even a moment. As the sun was eclipsed, there appeared four sets of glowing eyes in the darkness before the king. The counselors fell to their knees with horror, and the court jester began cackling madly.

The largest form moved closer. "We are the Naga'an ancient race of serpents from a land you have never seen. We seek a place of refuge here in Sarnoth. I claim your crown and your castle, in return for your life."

The king was the only one who survived the massacre that followed. He was found the next morning, ragged and filthy, wandering the countryside. The castle is devoid of human life, and there are none brave enough to venture within and see just what form of creature lives there.

The purpose of your quest, adventurer, is to journey into the dungeons beneath the castle, destroy the Naga, and return the crown and kingdom of Sarnoth to their proper owner. You will need courage, luck, and wit to succeed in the *Vault of Terror.*

This game is the result of an argument I had with a teacher at the college where I study in Texas. He thought my concept of a fast, three dimensional graphic game utilizing multiple sprites, page flipping, and sprite priorities, written in less than 20k of BASIC, was utterly out of the question, not without most of it using system jumps to machine language routines.

Well, here it is. I think you will agree that it is superior to most commercial games of this type, both in speed and quality. My one regret is that I could not throw in more monsters, but the program is a typing chore as it stands. I think you can type it in over two or three sittings, however—and you will find it well worth your time.

Gameplay is relatively simple and self-explanatory. You need a high quality joystick plugged into Port 1. Remove any utilities which might interfere with program memory above 49152, as this program uses the fourth block of video RAM almost exclusively. (I found that the game does not work with *Mach 5* from Access.)

When you run the program the first time, the screen will be dark until the character set is redefined. There will be a short pause (10 seconds) as the game is initial-

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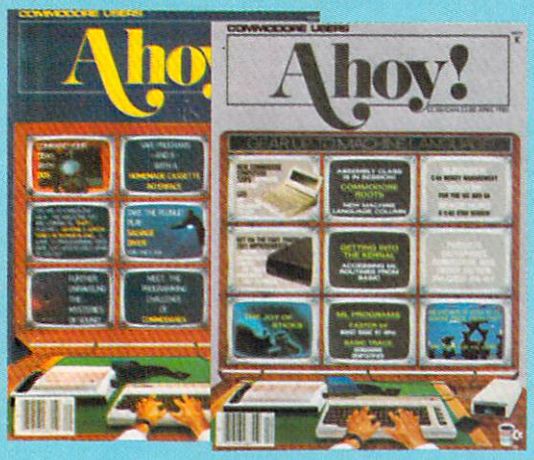

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ized, sprite data loaded, character data relocated, etc. The eight treasures in the game will appear on the screen. Remember what they look like. When the green bar appears at the bottom, with a choice of pressing f1 or f2, hit f1, since you do not have a game saved on disk yet. The title screen will disappear and you will find yourself in utter darkness, with only a red bar at the bottom of the screen, with several funny little symbols on it. The two letters on either side of the bar are your direction indicators—they show you which direction you are currently facing (N,S,E,W). Your only possession is a wooden torch. To use it, press the joystick button with the stick centered. The screen should light up, and you will find yourself looking down a long corridor, with a few turns and perhaps a coffin or a pit, with the shaft you came down above your head. To move forward, push the joystick forward. The bar at the bottom will flash the same color as the corridor, and the view will change, showing you one block forward of where you started. To turn left, push the joystick left. To turn right, push the joystick right. To go back, pull the joystick back. Whenever you move, the bar at the bottom will flash for a moment, and the new view will appear. If you have turned left or right, your direction indicators will show you your new compass bearing. Whenever you try to move through a wall, or try to enter a door backwards, there will be a little beeping sound to tell you that you can't move that way. As you wander through the vault, creepy music will play continuously in the background.

The bar at the bottom is the command bar. It has on it everything you can carry in this game. You can only carry one object of each kind. To see what you are currently carrying, simultaneously push the button and pull the joystick backwards. There will be a pause, and you should see a flashing cursor on the first object. Now simultaneously release the button and return the joystick to the center position. The cursor should remain flashing. The cursor is controlled by moving the joystick to the right (and only to the right) and releasing it when the white cursor is on the object you wish to manipulate. The bar reveals which objects you own by illuminating them in light red. You do not possess those in dark red. The object you are currently using is in yellow. If you want to pick UP an object, push the joystick up. If you want to put DOWN an object, pull the joystick down. If you possess an object (light red) and want to HOLD that object, move the cursor to it and push the button. There will always be a beep. The object will light up in yellow if you possess it, and you will be holding it. If you do not possess it, it will stay in white, and you will be holding either the torch or the last object you had. Either way, pushing the button leaves the command bar, and puts you back in control of movement. Now any time you push the button, you will USE the object you are holding (yellow).

The objects are, from left to right, torch, sword, shield, ring, rope, wand, key, gold, and the crown. Each object can be held, but using some objects, like the gold, will not have any effect. Some objects aid you just by possessing them, like the shield or the torch (which continues illuminating your way whether you hold it or not.)

You must be standing in a block to view the contents of the block. They will appear in front of you, on the floor.

Other objects have very special uses indeed, like the wand or the ring, and only display their properties when used. Basically, the purposes are as follows:

Torch: lights way, serves as makeshift weapon in absence of sword.

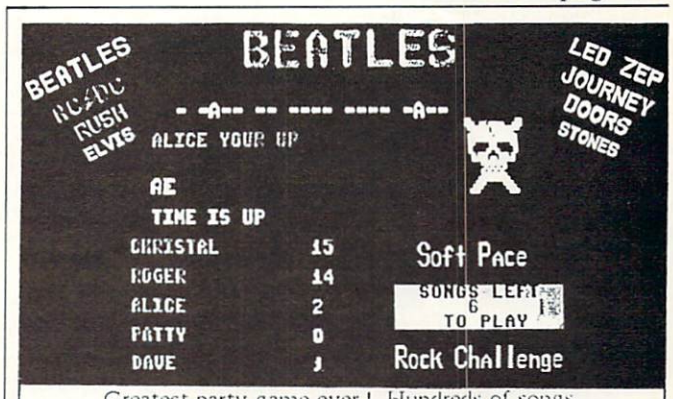
Sword: main weapon against monsters.

Shield: main protection. Absorbs 75% of blows.

Ring: much like that of Bilbo Baggins in *The Hobbit.* Read the book if you are not familiar with it. Without giving everything away, the ring gives you invisibility with a catch. The ring fools all the monsters except the non-organic ones. The only drawback is that your perception is weirdly altered when wearing the ring, and the dungeon appears distorted and unreal. You must take off the ring to attack anything. When you use the command bar, the ring will automatically be taken off.

Rope: used to climb down a shaft, or to indicate you want to go up if there is a LADDER and a CEILING EXIT in your block. You cannot go up without a ladder!

Continued on page 99



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Reader Service No. 112

21 SECOND BACKUP (Version 4.1)

VG Data Shack

Commodore 64 with 1541 Disk Drive

Disk and hardware; $39.99

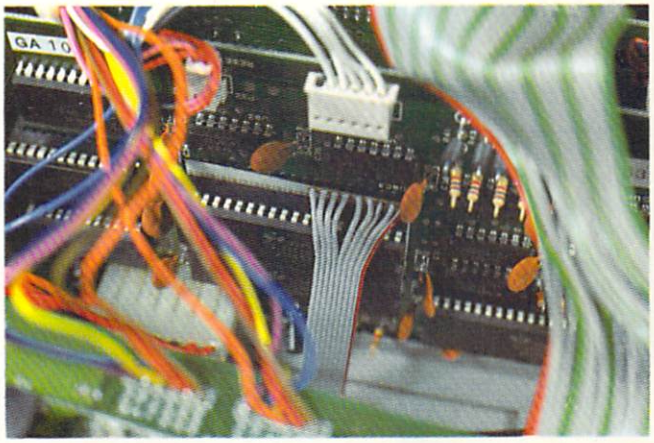
The magnetically encoded word is a fragile thing. The loss of a single bit from among the more than a million stored on the disk surface can render a program completely useless. Thus the need to back up all magnetic disks is a time-consuming but necessary evil which we will have to live with.

The 1541 disk drive is a sophisticated device with a built-in DOS and features that are not found on any other computer's disk drives. Unfortunately, when coupled with a C-64 computer, the 1541 is also one of the slowest disk drives ever made. The time needed to copy a single disk, using only Commodore's official DOS commands, is on the order of 40 minutes. This has resulted in a large number of software-based copy programs which work around the DOS's built-in limitations.

The *21 Second Backup* from VG Data Shack is a combination of hardware and software intended to assist in the duplication of Commodore 1541 formatted disks in the least possible time. It is designed for use with a Commodore 64 and one or two 1541 disk drives, or an SX-64 with its internal drive and an optional external drive. The result is the fastest 1541 disk duplication system available today. We clocked an SX-64 with an external drive at a mere 18 seconds for an unverified full disk copy!

How Fast Is Fast?

A normally formatted 1541 disk contains 35 tracks with varying amounts of data on each track. Once in the drive, the disk spins at a constant rate of 300 revolutions per minute. A simple calculation tells us that a complete data track will pass under the read/write head in just 2/10 of a second. Multiply this by 35 and double the result to permit writing it out, and we find that it should be possible to copy an entire disk in just 14 seconds.



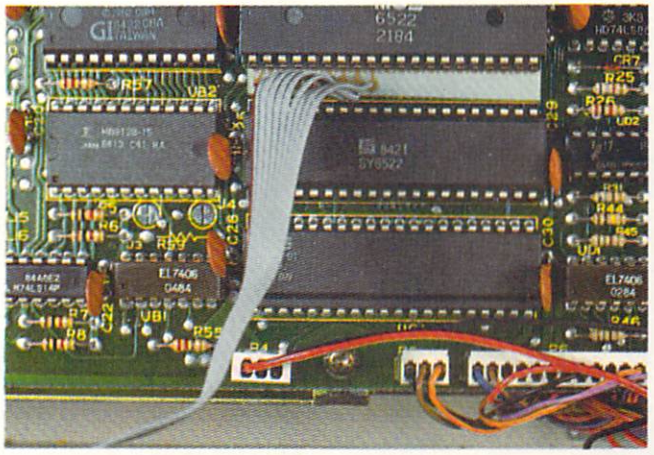
Installation of 21 Second Backup *in an SX-64. Access to the VIA chip is more difficult than on the 1541 (below). READER SERVICE NO. 280*

In the real world things are not that simple. Some time has to be allocated for the physical movement of the read/write head. In addition, numerous calculations have to be performed on the data to convert it from the eight bit codes in the computer into the 10 bit GCR codes used by the drives. However, even when all these things are taken into account, we are still a long way from the aforementioned 40 minutes. All this really makes the 18 seconds we mentioned above a real accomplishment.

A large part of the data transfer delay is associated with the fiendishly slow serial bus as implemented on the C-64. Maximum transmission speeds on this channel, without special software enhancements, are less than 700 characters per second. *21 Second Backup* sidesteps this limitation by providing its own communication path.

What It's Made Of

The key to the performance of *21 Second Backup* is a simple piece of hardware whose major components are two 6' lengths of nine conductor ribbon cable. This pair of cables are equipped with three terminations. Two of these are low profile, 40 pin dual in-line integrated circuit sockets (40 pin DIP sockets to those who know about these things). Each DIP socket is mounted on a paper thin printed circuit board upon which the nine conductors terminate. The third terminal consists of a 24 pin printed circuit edge card connector which mates to the user port on the C-64.



Installation in the 1541 requires opening up the drive and prying out a 40 pin chip. The connection does not interfere with any disk drive operations.

The secret of *21 Second Backup* lies inside each and every 1541 disk drive. Among other things, every

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1541 is equipped with a pair of 6522 Versatile Interface Adapter large scale integrated circuits (VIA chips). The VIA is a specialized chip designed to handle serial and parallel communications among the various components of a microcomputer. Each VIA has two complete bidirectional eight-bit data ports. Of these four eight-bit ports, the 1541 only utilizes three. In fact, the fourth port is not even connected to anything inside the disk drive.

If you haven't guessed it by now, the 40 pin DIP sockets on *21 Second Backup's* cables hook up to the unused port inside the 1541. To accomplish this you will have to open up your disk drive and pry out the appropriate VIA chip from its socket (remember there are two VIAs in every drive). The 40 pin DIP socket is then pushed into the one on the 1541's circuit board and the VIA chip is reinstalled into the 40 pin DIP socket. The installation actually extends the 1541's VIA socket while permitting access to the unused parallel port.

The computer end of the cable goes directly to the C-64's user port. This port is internally connected to a 6526 Complex Interface Adapter (CIA chip) which is actually a big brother to the 6522 VIAs in the disk drive. If you have been following along until this point you will not be surprised to learn that the C-64's user port sports an eight-bit bidirectional data port originating from the built-in CIA.

The result is a fully wired eight-bit parallel bidirectional channel between the C-64 and one or two 1541 disk drives. In fact, since the VIA and CIA are tied directly to the microprocessor's data bus, this channel is as fast as the 6502 in the 1541 and the 6510 in the C-64 can be programmed to read and write data. This is very fast indeed.

What It Can Do

21 Second Backup provides three high speed full disk copy utilities on its accompanying disk. The first utility is the basic copier which will duplicate unprotected disks as well as most basic copy protection schemes.

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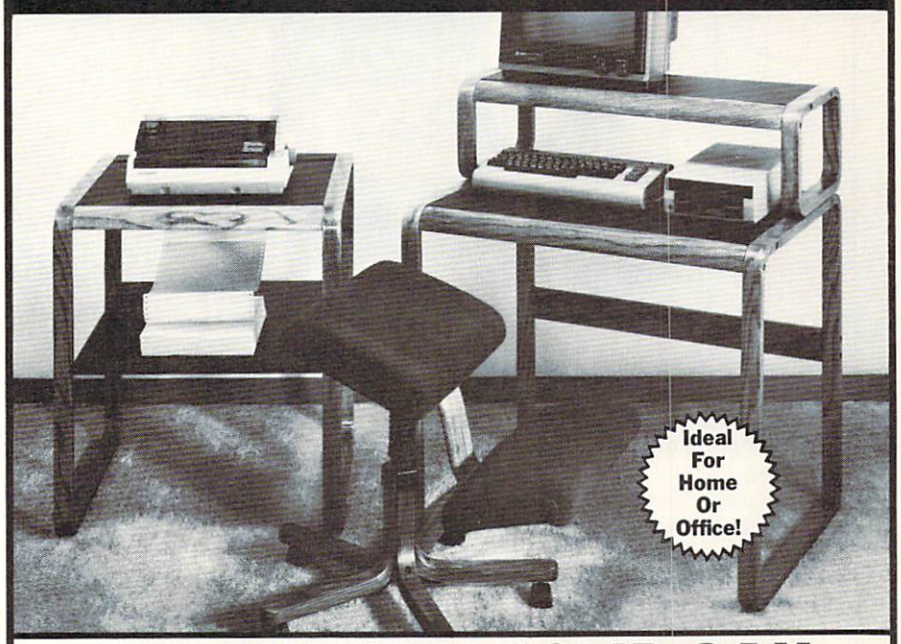

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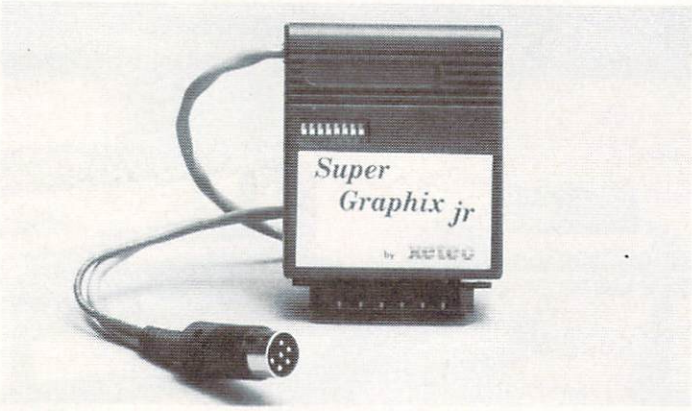

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As mentioned above, this can be done in as little as 18 seconds, with verify off, using two disk drives. If you are using only one disk drive, most of your time will be spent on the five pairs of disk swaps required to copy a disk. The actual single drive disk time is less than 35 seconds.

If the verify option is turned on, the two drive copy time increases to 30 seconds. We are not certain just what is verified by the latter option. We found the program would copy a disk to a second drive without a disk in it and nary a peep that anything was amiss.

The second utility is a "super" copier which handles the newer synchronization copy protection schemes. This copier analyzes the entire disk, out to track 40, to determine the type of protection before doing the actual copying. The third utility is similar to the second with the inclusion of half-tracking. All the copiers function automatically with no user-settable parameters other than the selection of the copier and the verify toggle.

The addition of the external parallel channel between the 1541 and the C-64 should give *21 Second Backup* the ability to copy more forms of copy protection than any purely software driven nibble copier. Interestingly enough, the *21 Second Backup* program disk is copy protected and it will not copy itself! Not unexpectedly, there are several forms of copy protection on the market which are resistant to any and all 1541 copy schemes due to the built-in limitations of the disk drive's hardware.

As with other nibble copiers, *21 Second Backup* relies on parameter files to handle these uncopyable schemes. The parameter list provided with Version 4.1 of *21 Second Backup* contained only a single entry for Accolade Software. Interestingly enough, it did not work on the copy of *Fight Night* upon which we tried it.

VG Data Shack justifies the limitations on what *21 Second Backup* will copy by saying that "(allowing the program to copy everything) would quickly accelerate the advance of copy protection." We feel that this

statement makes as much sense as putting copy protection on a copy program.

Installation Notes

We remind you that installing *21 Second Backup* does require you to open up the 1541 disk drive and pry out a 40 pin chip. If you are using an SX-64 you will have to open up the computer itself. Access to the disk drive VIA chip on the SX-64 is far more difficult than on the 1541 disk drive. *21 Second Backup* also expects both disk drives to be device number eight. This may be cumbersome to 1541 users who have modified their second drive as a permanent device nine by cutting the printed circuit trace.

The connections to the paper thin printed circuit boards on which the 40 pin DIP sockets are mounted are fragile. The spacing between socket pins is only 1/10 of an inch. Perform the installation carefully while paying particular attention to pin alignment. The 40 pin DIP sockets use open frame construction. When removing the VIA chips, take care to avoid damaging the disk drive's printed circuit traces which run under the socket.

The VIA chip can be damaged by static electricity discharging from your body. We haven't the space to expand on the ways of controlling static electricity. Note that hot and muggy summer days, without air conditioning, will reduce static buildup. In any case, avoid direct contact with the VIA's pins.

The connection to the disk drives never gets in the way of any 1541 operations, since the disk drive VIA port used by *21 Second Backup* does not really exist as far as the 1541 DOS is concerned. The connection to the computer's user port will have to be removed to permit the use of accessories such as modems.

Once *21 Second Backup* is started up the disk drive motor spins continuously. The drive cannot be turned off, as this would wipe out the custom code which is downloaded to the disk drive's RAM. We have some reservations with regard to the ability of the disk drive's motor or its power supply to continuously operate in this fashion for long periods of time. We would appreciate hearing from anyone with experience in this matter.

The latest version of the 1541 disk drive is not fully compatible with *21 Second Backup.* It cannot be used to load the program; however, it may be used as the destination drive in a two-drive setup. The new drive may be recognized by the brief spin of the disk which is performed immediately after insertion.

Conclusions

21 Second Backup is definitely the fastest dual drive copy program available for any disk drive. In view of the built-in limitations of the 300 RPM speed, we do not expect to see anything faster. The copiers worked reliably and consistently. However, the built-in verify routines seem to need some work. The package is well worth considering by anyone who frequently needs to duplicate entire disks.

VG Data Shack, 5625 Grand Allee Blvd., Loc (5), Brossard, Quebec, Canada J4Z 3G3 (phone: 514-445-9663). *—Morton Kevelson*

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IntraCourse is a computerized questionnaire/analysis. Readers of *Penthouse, Cosmopolitan*, and their ilk will be familiar with this type of instrument—at least in its printed form. From its hot pink and flesh colored title screens, *IntraCourse* develops into a straight text program of do you, would you, can you, should you....

The C-64 version of *IntraCourse*

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The publisher cannot assume responsibility for errors in the above listing.

is supplied on four disks. This indicates the amount of text the programs have to choose from as they question, analyze, and compare you. *IntraCourse* is totally menu-driven and offers five primary options.

First, you'll want to create your sexual profile by answering 50 to 100 multiple choice questions. Depending on your answers to specific questions, the program may branch to other questions that explore the detail of your previous answers. Answers that might be characterized as traditional will result in the shortest series of questions.

Questions are shown two at a time with answers picked by the arrow keys. For each pair of questions, you must confirm that your answers are correct. You cannot review or revise your answers any time after that without redoing the whole profile—a 15 to 30 minute process.

Using the multiple choice format has inherent limitations. When you're asked if you do...never, occasionally, often, or always, the format works. When you must choose which of a series of descriptive words or sentences best fits you, there may be no answer you like (or no answer you don't like), yet you must choose one. Do you, for instance, think sex is based on challenge, conquest, love, intimacy, or lust? Pick one. Do not qualify or amplify your answer. Are you satisfied with that answer?

The second option in *IntraCourse* is to analyze your sexual profile. With Epyx's *Fast Load* or another disk speedup program, this analysis will take only a minute or so before it begins to appear on the screen or printer. A full analysis runs from 3 to 15 pages and covers sexual style, sexual personality, special sexual behaviors, and sexual dysfunction. At the end of each section, you'll be referred to published references where you can read more. Citations for over four dozen of these references are listed in the *IntraCourse* manual.

With only 50 to 100 of your answers to draw on, the *IntraCourse* analysis may occasionally surprise you. Based on as few as one or two of your responses on certain topics, the analysis will apply a label to your behavior and then tell you what that label implies clinically. While entering various "personalities," I was surprised that one behavior which I said occurred "rarely" was listed in my analysis as a major dysfunction. According to the program, that particular dysfunction, if it occurs at all, must occur more than 50 percent of the time. I haven't figured out why "rarely" was offered as an answer.

IntraCourse's third option lets you compare your sexual profile to published statistics. Fourteen of your specific answers are compared to national statistics and a bar chart is shown onscreen. You'll see what proportion of people do...never, occasionally, often, or always, and which group you fit into.

Fourth, you can compare your sexual profile with someone else's for compatibility. You'll see twelve bar graphs showing where you fall in ranges like dominant/submissive, comfort/discomfort, and intimate/distant. Then you'll see a compatibility analysis for you and the chosen "other."

This analysis uses the paired terms, but never really describes or defines them. In about two pages, it will focus on the different styles, preferences, and biases of the two people, and make general suggestions on how best to adapt. If you like crowds, and your "other" is more solitary, it may suggest that you each cultivate nonsexual relationships with friends more like you. Although a print option is offered for the compatibility profile, I could never get it to print.

Just for fun, I asked for a compatibility profile on two of my hypothetical characters—Mr. Macho and Mr. Milktoast. Both are avowed and dedicated heterosexual males. On a score of 0 (incompatible) to 100 (highly compatible), I expected them to get about a 3. When this unlikely pair scored over 70 percent compatibility I nearly slid out of my chair.

The fifth major option on the *IntraCourse* main menu is to access a sex dictionary. It is supposed to define scientific and popular terms you may encounter in the program. I could never get the dictionary option to work. I would either be returned to the main menu or, if I tried to get to the dictionary from the analysis module, the program would crash.

I started by saying you could perceive *IntraCourse* as educational, therapeutic, or recreational. As an educational program, it will almost certainly teach you a few new terms (though perhaps for old activities). And it will tell you how you compare statistically. Are you in the 7 percent group or the 93 percent group? It may be important to know.

As a therapeutic device, it's not. Right there, at the bottom of page 13 in the manual, it says (and I paraphrase): What we've told you is for information and entertainment, it's not necessarily accurate, and you should see a professional if you want a professional diagnosis. There's something about computers, though. They're credible. We look at computer printouts and we don't question them. *IntraCourse* analyses cannot be read that seriously.

If you're a psychological hypochrondriac, you'll find out that you may be things you didn't even know existed. *IntraCourse* encourages you to be honest and open; it even provides password security. You may tell your C-64 things you'd only tell your dog otherwise—and only when he's asleep.

As an entertainment program, *IntraCourse* has real potential. If you'd like to sit down with a group of friends and let the computer suggest who "really" ought to be paired up with whom, you could have some fun. Or spend an evening by yourself trying on personalities and seeing which ones are the most interesting.

IntraCorp, Inc., 13500 SW 88th Street, Suite 185, Miami, FL 33186 (phone: 1-800-INTRACO or 305-382-6567). *—Richard Herring*

All the programs in this issue of *Ahoy!* are available on disk. See page 54 for details.

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ATTACK FORCE

For the C-64

By Mike Hoyt

In the distant future, the earth has been captured by aliens who need to mine it for precious minerals their civilization depends on for survival. They do not care for the welfare of the humans, whom they treat as beasts.

A few humans escaped and mounted an attack on the alien bases. But the aliens were prepared for an offensive, having surrounded themselves with heavily armored fortresses. And so earth's only hope of liberation was lost.

But hope was revived when your fleet of Omega fighters arrived to exterminate these evil aliens. You must penetrate nine fortresses and destroy all the alien command bases, using your four Omega fighters. If you succeed, the earth will be free again. However, if you fail....

HOW TO PLAY

Enter the program listing on page 106 and save it to tape or disk. Type RUN press RETURN. In a few moments you will be presented with a screen allowing you to select the difficulty level using the f1 key. The difficulty level determines which fortress you start at. Press the f3 key when you are ready to begin.

At the front of each fortress you will be told how many bases you have left to destroy before you can advance to the next fortress. After the warning alarm stops, you begin your raid.

You have complete control over your ship's motion. Using a joystick in Port 2, you can move the Omega fighter in eight directions, as well as fire your twin lasers by pressing the joystick trigger.

There are many obstacles in your way. These include electro-barriers, walls, bombs, and the aliens' defense saucers. You must maneuver around the walls and the electro-barriers, but you can destroy the saucers with your lasers. The bombs pose yet another problem. You cannot see them, but you can hear a whistle as they fly toward you. The scanner at the lower right of your screen shows about where the next bomb will land (a red dot).

The bases, which are towers, can be easily destroyed with a single blast from your lasers. When you destroy enough bases, you will receive a bonus for the amount of fuel you have left (if the fuel runs out, your ship crashes). Then you will proceed to the next fortress with a full tank. ☐ *SEE PROGRAM LISTING ON PAGE 106*

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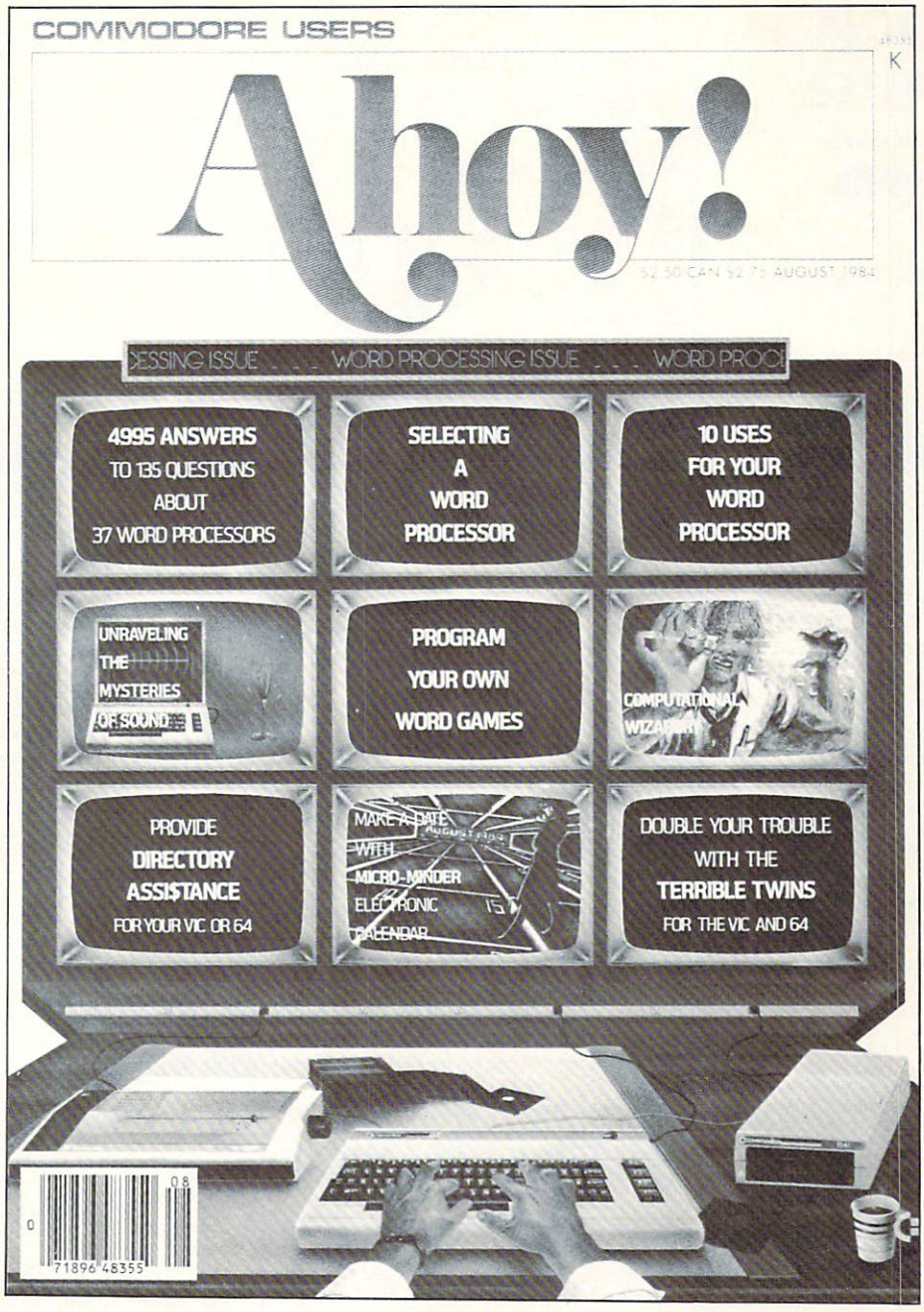
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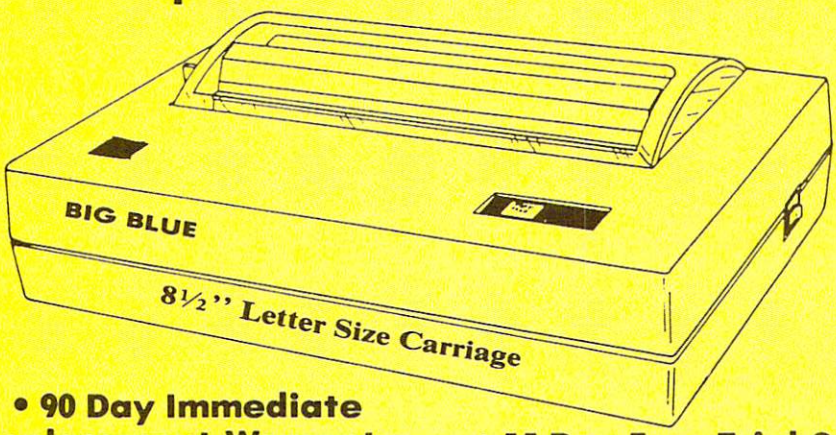

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6102	Agatha Christie (D)	$21.95
5066	Perry Mason (D)	$21.95

Data East

6008	Commando (D)	$21.95
1552	Karate Champ (D)	$21.95
1551	Kung Fu Master (D)	$21.95

Windham Classics

3081	Alice in Wonderland (D)	$9.95
3080	Below the Root (D)	$9.95
3079	Swiss Family Robinson (D)	$9.95
3087	The Wizard of Oz (D)	$9.95

Educational

Fisher Price

3095	Alpha Build (C)	$4.95
3070	Dance Fantasy (C)	$4.95
3069	Linking Logic (C)	$4.95
3072	Memory Manor (C)	$4.95
3073	Logic Levels (C)	$4.95

Designware

5100	Algebra 1,2, or 3 (D)	$19.95
2518	Body Transparent (D)	$26.95
2517	European Nations (D)	$26.95
0824	Grammar Examiner (D)	$26.95
0832	States & Traits (D)	$26.95

Spinnaker

5300	Alphabet Zoo (C)	$4.95
5090	Delta Drawing (C)	$4.95
5301	Facemaker (C)	$4.95
5303	Kindercomp (C)	$4.95
3077	Number Tumblers (C)	$4.95
3078	Sea Spellers (C)	$4.95
3076	Up & Add 'Em (C)	$4.95

Weekly Reader

2515	Stickybear ABC (D)	$14.95
5130	Stickybear Math (D)	$14.95
2512	Stickybear Numbers (D)	$14.95
5132	Stickybear Reading (D)	$14.95
5126	Stickybear Spellgrabber (D)	$14.95
5129	Stickybear Typing (D)	$14.95
5128	Stickybear Townbuilder (D)	$14.95

Hayden

2160	Sargon II (D)	$9.95
0261	SAT Math (D)	$14.95
0262	SAT Verbal (D)	$14.95
2164	SAT Sample Tests (D)	$14.95

American Educational Computer

2493	Grammer Word Use (D)	$9.95
2499	Biology Facts (D)	$9.95
2521	AEC Spelling (D)	$19.95
2496	French Vocabulary (D)	$9.95
2495	Spanish Vocabulary (D)	$9.95
3747	Learn to Read (D)	$19.95
3745	Phonics (D)	$19.95
2519	U.S. Geography (D)	$9.95
2520	U.S. Goverment (D)	$9.95
2498	U.S. History (D)	$9.95

Business

C128 Software From Timeworks

5022	Word Writer (D)	$49.95
5024	Data Manager 2 (D)	$49.95
3048	Sylvia Porter (D)	$49.95
5030	Partner (C)	$49.95
5026	SwiftCalc/Sideways (D)	$49.95

Add $10.00 for shipping, handling, and insurance. Illinois residents please add 6½% sales tax. Add 20.00 for CANADA, PUERTO RICO, HAWAII, ALASKA, APO-FPO orders. All orders must be in U.S. Dollars. WE DO NOT EXPORT TO OTHER COUNTRIES EXCEPT CANADA. Enclose Cashier Check, Money Order or Personal Check. Allow 14 days for delivery, 2 to 7 days for phone orders, 1 day express mail. Prices & Availability subject to change without notice.

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Famous Comstar National Brand

10" Printer Sale

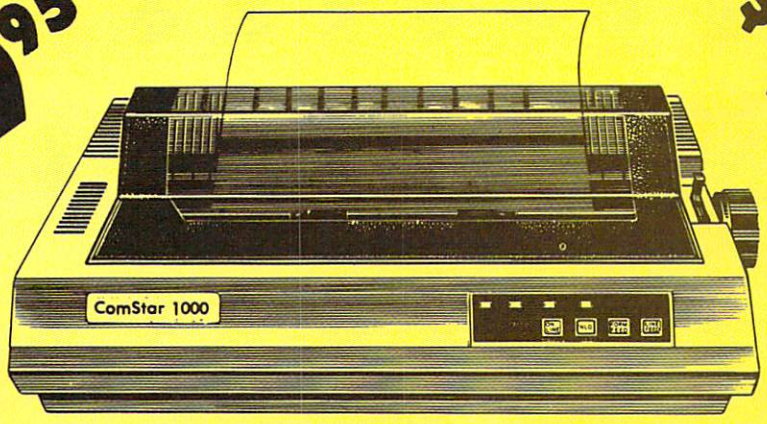
Includes Commodore Interface

Near Letter Quality *Near Letter Quality*

Best Value in the USA

• 100 CPS draft/20CPS near-letter quality • Dot Addressable Graphics • Adjustable Tractor and Friction Feed • Automatic Paper Loading • Right and Left Margin settings • Pica, Elite, Condensed, Italics • Superscript • Subscript • Underline, Bold print, Double Strike • Superb NEAR LETTER QUALITY

$179.95



$179.95

Easy to Use

Fantastic Graphics

2 Year Warranty

The Comstar 1000 is one of the best values in the United States today. Print your letters, documents, programs, pictures, and more at a blazing 100 Characters Per Second or 20 cps in the Near Letter quality mode. (Looks just like it came from a typewriter.) Plus, choose your printing mode (NLQ, Draft) from your wordprocessor or by simply pushing the controls on the front panel. Fantastic Quality at a Fantastic Price.List $349.00 SALE$179.95.

Print Method
Serial impact dot matrix (9 pin)

Print Speed
Draft- 100 CPS NLQ- 20 CPS

Character Sets
96 ASCII Characters, Marker, Symbols (Includes Italic font)

Ribbon (Life exp.)
Black: cassette (2.5 million characters)

Dimensions
15.4 (W) x 10.9 (D) x 4.7 (H) Inch

Weight
Approx. 10 lbs

Character Spacing
Fixed

Line Spacing
1/6, 1/8, 7/72, and 1/216 inch

Paper Feed
Adjustable tractor and friction feed

Paper feeding Direction
Bi-directional

Copies
2 plus original

Supply is Limited so Buy Today

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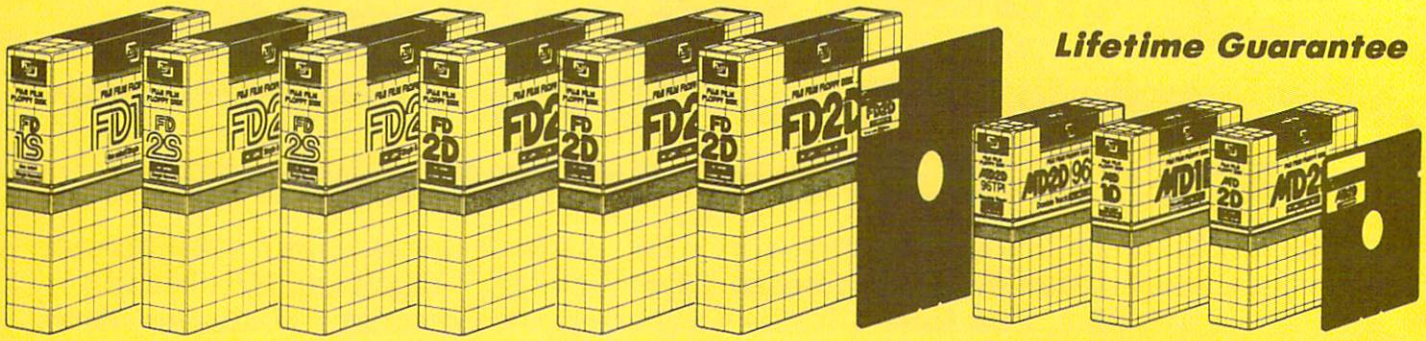
Special Buy - One Time Only Pricing

FUJI Floppy Disk SALE 49¢ ea.

List $2.95

Premium Quality Floppy Disks



Lifetime Guarantee

Box of 10 *with hub rings, sleeves and labels*

List $29.95
One Time Only Sale $4.90
Per Box/10

Famous Brand FUJI Floppy Disks for those who care about keeping their data.

Single Sided — Double Density for Commodore 64, Atari, Apple

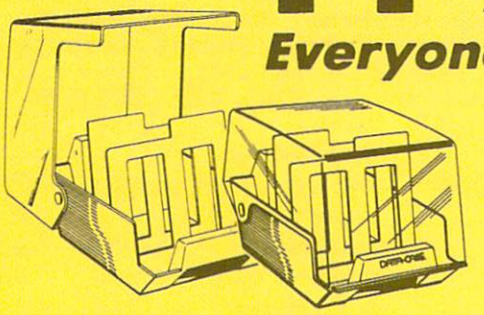
Super Special Deal **Box of 10** **No Limit, Dealers Welcome**

Net Cost 49¢ ea.

*** $12.95** ☆☆ ***Flip-N-File*** ☆☆ *** $12.95**

Flip/Sort

Floppy Disk Filer



Everyone Needs a Floppy Disk Secretary

Facts:

- Dust and Dirt particles can hurt your disks
- Most disks go bad due to mishandling in storage
- Proper filing of your disk collection will reduce unnecessary handling of your disks

The Floppy Disk Filer is an inexpensive hard plastic Fliptop case that will allow for easy filing, and protect your disks from dust, smoke, and dirt. Plus, the Floppy Disk Filer will keep all your disks out of unwanted hands and in one place where you can easily find them. **(Holds Over 50 Disks)**

List $24.95 **Introductory Sale Price $14.95** **** Coupon $12.95***

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Daisy Wheel Printer/typewriter

Students • Teachers • Business • Home Users

• Superb computer business printer combined with the deluxe electronic typewriter • Two machines in one — just a flick of the switch • Superb Letter Quality correspondence • 12" Extra Large carriage • Drop in cassette Ribbon • Precision Daisy Wheel printing • Key in Buffer • Centronics Parallel interface

Sale $199.95

Sale $199.95

Now you can have the advantages of a letter quality Daisy Wheel printer and the convenience of a typewriter for one low cost. Use your wordprocessor to type the letters, then with just a flick of the switch, your typewriter can type the envelopes. This is a fantastic Printer and a fantastic Typewriter. Every student and home business needs this machine. List $299.00 **Sale $199.95**

Printer:	
Paper width	12 inches
Printing width	10 inches
Cassette ribbons	Correctable film, one-time film, and fabric
Correcting tapes	Lift-off and cover-up
Line space lever	0,1,1-½,and 2
Keyboard selector	I and II
Print pitch	10,12, and 15

Keyboard:	
Keys/characters	44/96
Automatic carrier return	
Automatic correction	25 ch.
Automatic underline	
Relocate key	
Tabulation	
½ back space key	

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FLOPPY DISKS SALE *39¢ ea.

Economy Model or C-128 Cadillac Quality

We have the lowest prices!

***ECONOMY DISKS** For use with Commodore 64, Atari, Apple.

Good quality 5¼" single sided double density with hub rings.

Bulk Pac	100 Qty.	39¢ ea.	Total Price	$39.00
Box w/ sleeves	10 Qty.	79¢ ea.	Total Price	7.90

☆ C-128 Computer Disks ☆

CADILLAC QUALITY (Double Sided, Double Density) ***Specifically designed for use with C-128***

• Each disk certified • Free replacement lifetime warranty • Automatic dust remover • Works with IBM PC

For those who want cadillac quality we have the C-128 Floppy Disk. Used by professionals because they can rely on C-128 Disks to store important data and programs without fear of loss! Each C-128 disk is 100% certified (an exclusive process) plus each disk carries an exclusive FREE REPLACEMENT LIFETIME WARRANTY. With C-128 disks you can have the peace of mind without the frustration of program loss after hours spent in program development.

100% CERTIFICATION TEST **DOUBLE SIDED 59¢ Each**

Some floppy disk manufactures only sample test on a batch basis the disks they sell, and then claim they are certified. Each C-128 disk is individually checked so you will never experience data or program loss during your lifetime!

FREE REPLACEMENT LIFETIME WARRANTY

We are so sure of C-128 Disks that we give you a free replacement warranty against failure to perform due to faulty materials or workmanship for as long as you own your C-128 disk.

AUTOMATIC DUST REMOVER

Just like a record needle, disk drive heads must travel hundreds of miles over disk surfaces. Unlike other floppy disks the C-128 smooth surface finish saves disk drive head wear during the life of the disk. (A rough surface will grind your disk drive head like sandpaper). The lint free automatic CLEANING LINER makes sure the disk-killers (dust & dirt) are being constantly cleaned while the disk is being operated.

C-128 Disks are definitely the Cadillac disk in the world

Just to prove it even further, we are offering these super LOW INTRODUCTORY PRICES

1 Box of 10 — $5.90 (59¢ ea.) 5 Boxes of 10 — $29.50 (59¢ ea.) 10 Boxes of 10 — $59.00 (59¢ ea.)

0029 Paper Economy Sleeves (10) 50¢ 0030 Paper Economy Sleeves (100) $5.00

☆ ☆ COMMODORE 64 ☆ ☆

PARTY QUIZ ONLY $14.95

Trivia Controller & Software

Discover a better way to learn while you play, at a new, low price. Learning and entertainment are probably the reasons you bought a home computer. We've created a new, unique hardware/software system, like nothing ever produced for home computers, that satisfies those two motivations. It's called PQ, The Party Quiz Game. Included in each package are four special controllers (one for each player), a program disk and General Edition 1 disk containing 2700 questions covering a variety of subjects. PQ's Question / Answer Library (6 optional packages) expands the total number of questions to over 18,000. PQ asks the players a question; all are allowed to respond at once. Points are awarded for correct answers which are displayed on screen after a time elapses. All age and education levels, from reading age on up, can play thanks to PQ's "handicap" feature. Find out for yourself why Party Quiz gets 4 star ratings. List $49.95. **Sale $14.95.**

PQ's four exclusive Quick Response™ controllers free players from keyboard captivity.

Additional Trivia Software Modules

	List	Sale
General Edition 2,3 (specify)	$39.95	**$12.95**
Sports Edition	$39.95	**$12.95**
Education Edition	$39.95	**$12.95**
Bible Edition	$39.95	**$12.95**
Entertainment Edition	$39.95	**$12.95**

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Home Control

Protect Your Home ***Save On Utilities*** ***Regulate Appliances and More!!***

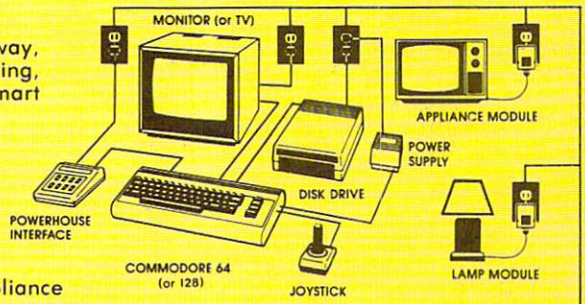
Controls Lights, Appliances, Thermostats, and More Throughout Your Home for Added Convenience, Security, Safety, and Energy Savings. Without Tying Up Your Computer

$49.95 **$49.95**

Free Lamp Module ($19.95 value) with purchase of X-10 computer interface.

The X-10 POWERHOUSE Computer Interface is programmed from your Commodore 64 or 128. You can then turn off your computer or use it for something else. It does not tie up your computer. The software shows a graphical representation of your home and allows you to select a room, then select a light or appliance to be controlled, all just by pointing with the joystick. The interface sends digital signals over your existing house wiring to control your lights and appliances which are connected to plug-in modules (sold separately) List $99.95. **Sale $49.95.**

It can wake you up to stereo or TV news. Light up your bedroom, hallway, bathroom. Start the coffee, start your central heating or air conditioning, warm up the curlers, all before you even get out of bed. But it's smart enough not to wake you up on weekends. At night it can lower the heat, play music or your favorite late night TV show for as long as you want, and can first dim and later turn out the lights automatically.



Many types of modules are available including appliance modules for TV's, hi fi's, coffee pots, etc. Lamp modules which contain a dimmer and can be used for incandescent lamps up to 300 watts. Wall switch modules which also contain a dimmer and can be used for incandescent outside lights and ceiling lights of up to 500 watts. 220V heavy duty appliance modules for 220V air conditioners and water heaters. The thermostat controller for central heating and air conditioning. The 3 way wall switch for controlling incandescent lights operated by two switches. The heavy duty wall receptable module to replace your existing wall receptable, etc.

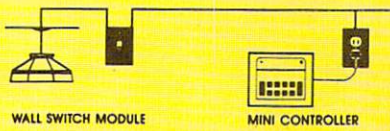
Plus, works with BSR, GE, Leviton, Radio Shack, and Sears Roebuck modules (all 256 codes addressable).

(Price does not include modules, please order modules as needed.)

Control Modules

	List	Sale
Lamp Module — 300 W incandescent	$19.95	**$14.95**
Wall Receptacle — replacement outlets	$24.95	**$19.95**
Wall Switch — turn on/off dim/brighten	$19.95	**$14.95**
3 Way Wall Switch — incandescent lights, for lights controlled by 2 or more wall switches.	$24.95	**$19.95**
Thermostat Controller — controls your existing thermostat	$39.95	**$29.95**

C64 & C128



	List	Sale
2 Pin Appliance Module, up to 500W appliances	$19.95	**$14.95**
3 Pin Appliance Module, up to 500W appliances	$19.95	**$14.95**

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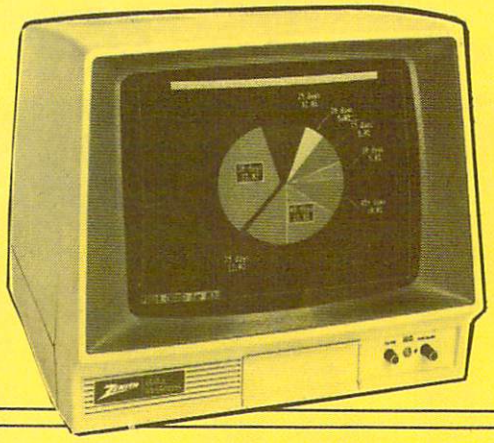
Computer Cleaners

Your Choice Reg. $19.95 **Sale $9.95**

½ PRICE SALE

Your Choice Reg. $19.95 **Sale $9.95**



TV/MONITOR SCREEN RESTORER & CLEANING KIT

Sale $9.95

Reduce eye fatigue by increasing the clarity of your TV or monitor screen. This kit contains a hard wax formulation to cover surface imperfections on TV screens and monitors. This restores maximum optical clarity, making what you see more distinct. Plus high absorbency cloths and an auto static spray cleaner allows you to clean your screen on a regular basis to keep your screen looking better than new. (This is a must for those who watch monitors or TVs for extended lengths of time.) List $19.95. **Sale $9.95.**

DISK DRIVE CLEANER

Reg. $19.95.
Sale $9.95

- 60% of all drive downtime is directly related to poorly maintained drives.
- Drives should be cleaned each week regardless of use.
- Drives are sensitive to smoke, dust & all micro patricles.
- Systematic operator performed maintenance is the best way of ensuring error free use of your computer system.

This unique twin slot jacket design gives twice as many "wet-dry" cleanings per rotation as other leading brands. Non abrasive, 100% lint free, random fiber cleaners capture dust, smoke particles and disk oxide build up which insures you against disk and data loss from dirty disk drive heads just like you must clean your albums and tape players you must clean your disk drive heads to keep your disk drive working well. (24 cleanings per kit.) List $19.95. **Sale $9.95.**

ANTI-STATIC KEYBOARD CLEANER

Sale $9.95

Now you can clean your computer keyboard fast, efficiently, and safely. The keyboard cleaning solution is exclusively formulated to remove skin oils, dust, and dirt that can destroy your equipment. Plus this non residue solution with anto-static properties will not build up like ordinary household cleaners so you can clean as much as you like without worry. Plus the lint free, high absorbency, non-abrasive cloths will not scratch or mar your equipment as they pick up dirt and grime in a matter of seconds. List $19.95. **Sale $9.95.**

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Color Monitor Sale

Sale

16 COLORS

(Premium Quality)

- Built in Speaker & Audio
- For Video Recorders
- For Small Business Computers
- Apple - Commodore -Atari - Aplus 3000 -etc.
- One Year Warranty'

(Premium Quality)

- Beautiful Color Contrast
- High Resolution
- Sharp Clear Text
- Anti-Glare Screen
- 40 Columns x 24 Lines
- Front Panel Controls

List $329.00

Sale $139.95*

Add $14.50 Shipping

80 Columns **RGB** Super High Resolution

13" Color Computer Monitor'

*C64/Atari composite cable $9.95

* C128 RGB/Composite 80 column cable $19.95.

14" RGB & Composite Color Monitor

Allows use of C-128 and C64 mode - composite and 80 column RGB mode. Must be used to get 80 columns in color with 80 column computers. Specially designed for use with the C128's special composite video output, plus green screen only option switch. (add $14.50 shipping)

List $399.00 Sale $239.95*

12" 80 Column Green/Amber Monitor

Super high resolution composite green or amber screen monitor. 80 columns x 24 lines, easy to read. Fantastic value. Limited Quantities.

List $129.00 Sale $79.95*

9" Samsung Hi Res Green Screen Monitor

Super High Resolution 80 column monitor perfect for Apple & Laser 3000/128 computers. Fantastic Value. Very Limited Quantities.

List $129.95 Sale $59.95*

Turn Your Monitor into a TV Set Without Moving Your Computer

Elegant TV Tuner with dual UHF/VHF selector switches goes between your computer and monitor. Includes mute, automatic fine tuning and computer-TV selector switches. Inputs included for 300 ohm, 75 ohm, and UHF. Can be used with cable TV and VCR's. Fantastic Value. Limited Quantities. (Includes loop antenna for UHF & RCA connecting cables) (Add $3.00 Shipping. Plus $3.00 for APO/FPO).

List $129.95 Sale $49.95

15 Day Free Trial - 90 Day Immediate Replacement Warranty

• LOWEST PRICES • BEST SERVICE IN U.S.A. • ONE DAY EXPRESS MAIL • OVER 500 PROGRAMS • FREE CATALOGS

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Rated No. 1 in Computer Education

DesignWare

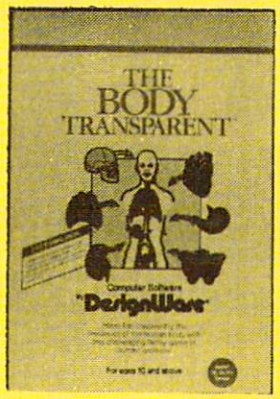
Commodore 64 SALE

Blue Chip

European Nations and Locations — An exploration of the continent that combines important facts and information in a challenging game format. The only European geography program that allows you to add questions of your own. If you miss a question during game play it is recycled to guarantee learning. Each game, you move nations to the proper location on a map of Europe. The map fills in with color as questions are correctly answered. Fast answers are rewarded with bonus points. Winner of the Parents Choice Award. (Disk)
List $44.95 **SALE $26.95**

Tycoon — It takes an individual with loads of confidence and driving ambition, to deal in the commodities marketplace. To foresee market trends and develop a plan of action before trading, are talents that can make or break you as you deal in precious metals, oil, grains and other items of necessity. Armed with charts and details from real-life situations of the past, you can research the market and make your move accordingly. The element of risk makes the game play a real challenge for all aspiring tycoons, or even established entrepreneurs. (Disk)
List $29.95 **SALE$16.95**

The Body Transparent — Learn basic anatomy as you play a game of facts and functions of the human body. Choose a male or female body and move bones and organs to their location. Then learn what the body parts perform. Find out where food is digested, the importance of kidneys and much much more. Add your own biology questions to help make homework fun or to challenge a friend. The game has multiple difficulty levels and bonus points for fast answers, plus color graphics. (Disk)
List $44.95 **SALE $26.95**



Baron — If you were given the opportunity to invest in real estate with a complimentary sum of money, say $35,000 and a time limit of 52 game -weeks to turn that into a million, how would you proceed? Baron is a program that offers you the chance to find out what your chances of success in this complicated venture will be. You must utilize the allocated funds wisely in buying, selling and developing land because real life influences like flunctuating mortage rates and other headaches that affect property owners will be apparent during play. It's challenging and risky to win the title of Baron (Disk)
List $29.95 **SALE $16.95**

States & Traits — A valuable learning tool for geography and history students. Learn basic geography and then go on to find out interesting facts about every region in the country. Find out where historical events happened on the map. As you play quick answers are rewardedwith bonus points. In the "States" part of the program you must move states into the right place on the map and the state lights up in bright color. In "Traits" you identify state capitals and landmarks. You can also design your own games (Disk)
List $44.95 **SALE $26.95**

Millionaire — Put yourself in high gear and join the risk takers, because you are about to experience the New York Stock Exchange. To get you started in investments you are given $10,000 and 154 stocks from 5 industry categories, the rest is up to you. Learn the market as you are faced with influences based on true to life events, good judgement is essential to whether you buy or sell and the status of your personal portfolio depends on making the right choices. The play includes and introduction to buying-on-margin, call options, put options and borrowing against your net worth. (Disk)
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Algebra 1,2, or 3 — An introduction to Algebra concepts and definitions. Helps students master the fundamentals of first year Algebra, addition of real numbers, multiplication of real numbers, solving equations, solving inequalities and absolute value sets. Students can learn in 4 ways: They can work the sample problems, read discussions of concepts, watch equations being solved, or study rules that govern mathematic operations. The result is that the student creates a learning process that he or she is most comfortable with. (Disk)
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Webster's Numbers — Introduce your young children to basic arithmetic concepts with this program that combines lively animation with four action games. For children with minimal reading skills, they will learn shape discrimination, eye-hand coordination, number recognition and sequential counting to name just a few. Children will delight in maneuvering a hot air balloon, leading a mosquito to safety and pushing blocks and triangles into different shapes. (Disk)
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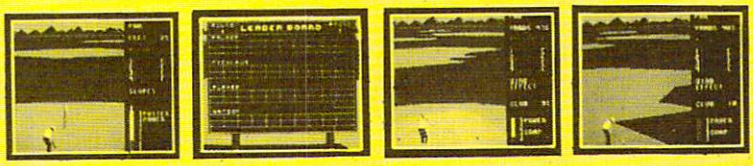

Leader Board — This is not just another golf program, it is the most realistic one on the market because it is really a simulator that allows true perspective of the game. Three levels of play take you from beginner to pro. The courses are difficult and require concentration to come in under par. (Disk) List $39.95. **Sale $23.95.** *Coupon $22.95.*

Disk No. 1 — Courses for Leader Board. Four different golf courses are on this disk of varying degrees of difficulty. List $19.95. **Sale $13.95.**

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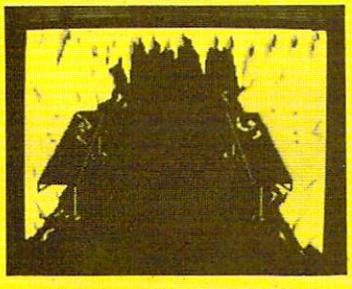
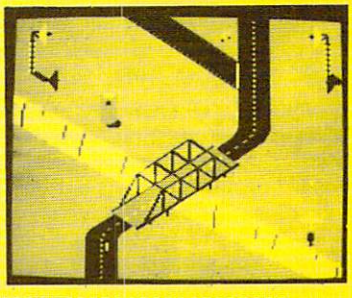
Mach 5 — Plug Mach 5 into the cartridge port and turn on the computer, the cartridge works automatically to load programs up to 5 times faster than normal. Loads 99% of all software, even copy protected games. Works with all popular printers. Will list directories without disturbing programs in memory. Commands such as LOAD, SAVE, OPEN etc. are executed with one keystroke. More features than most other "fast loaders". Does not disturb RAM. (Cart.) List $34.95. **Sale $19.95.**

Mach 128 — This "fast loader" will load programs up to 500% faster on the 1541 disk drive or the 1571 drive in 1541 mode, plus it has features that make it one of the best on the market. A full help menu, screen dump, 95% compatibility, 10 second formatting, plus much, much more. (Disk) List $49.95. **Sale $28.95.**

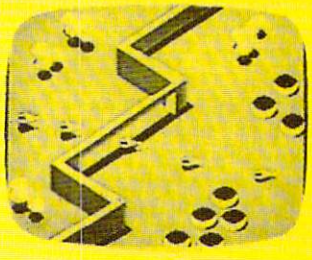


Beachhead II — Fantastic hi-res scrolling screens will lead you to new levels of excitement. Three scenarios, each with fantastic scrolling screens, add great realism to the game. First you maneuver your helicopter past tanks and artillery to the fortress wall. Then you must time your moves quickly as you go through the opening and closing gates. Scene 2 starts after you drop your paratroopers and make your way to the dictators machine gun emplacement. You must attack the dictator and rescue his hostages. Finally in Scene 3 you have the final confrontation plus you can be the rescuer or the dictator and play against an opponent or the computer. Fantastic two player Head to Head action. Highly recommended. (Disk) List $49.95. **Sale $22.95**



Beach Head — Multi Screen computer graphics at its finest. First you must maneuver your fleet through the mine laden channel while torpedoes are fired at you from all sides. Next you must engage the enemy planes with your anti-aircraft guns (best scenario graphics anywhere). Then you must sink the enemy fleet before they sink you. Next you maneuver to the beach head where your tanks must get through an obstacle course and finally fight the ultimate battle at Headquarters. All scenes in stunning 3-D graphics. List $39.95. **Sale $17.95.** (Disk or Tape.)

Raid over Moscow — The ultimate in multi screen computer graphics has arrived. (over six screens) The Soviets have launched an attack. First you must locate and destroy the ICBM missiles from your Stealth Bomber, then you must lead your squadron through the Soviet terrain to the Kremlin itself. Destroy the defenses, then destroy the defense center and finally the attack operations themselves. Fly planes, launch grenades, shoot bazookas. Super Fantastic Graphics, Sound, Animation. List $39.95. **Sale $22.95.** (Disk.)



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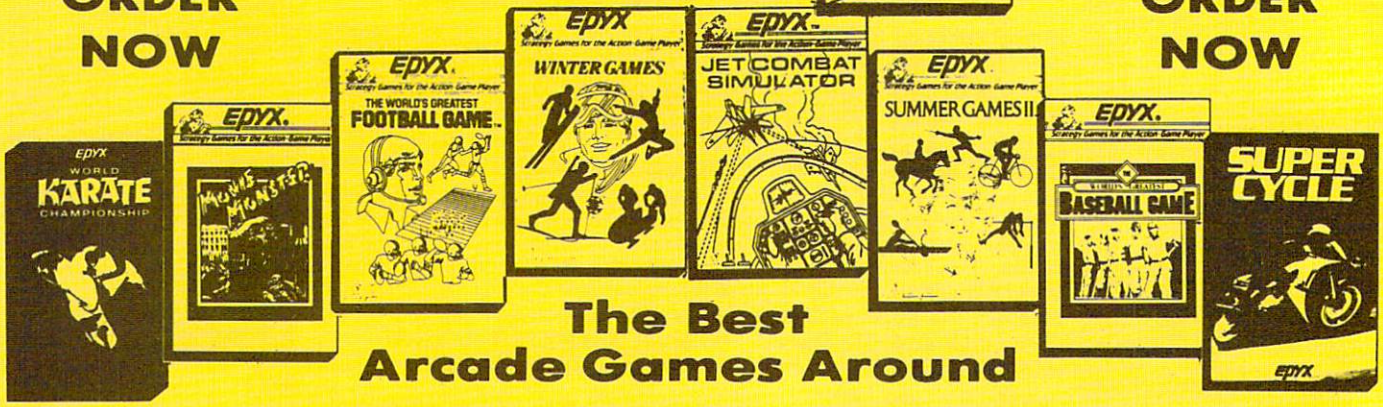

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Super Cycle — Experience the excitement and danger of motorcycle racing. Lean into the turns and cruise through the scenic Grand Canyon or the Rocky Mountains, as you race cross country. Measure your speed with your tachometer and speedometer. All the instruments are realistic. Features eight different courses, day and night racing and obstacles to challenge the driver, like road barricades, oil slicks and ice. The competition is stimulating and the graphics are first rate. (Disk) List $39.95. **Sale $23.95.**

The World's Greatest Football Game — This one has it all — strategy, action, three views of the field. It's in a class all its own! Finally, a football game that not only puts you on the field, but also on the sidelines in the coach's shoes. Use the "Playbook" or design your own offensive and defensive plays. Then, grab the joystick and put your strategy to the test. You control key players to run a sweep, make a tackle, throw a pass and even kick a fieldgoal. All the action and all the strategy make this your favorite football game. (Disk) List $39.95. **Sale $22.95.**

Winter Games — Experience the challenge of six winter sporting events. In the Bobsled, you're right in the tube careening along the walls. At the SkiJump, you control your form in take-off, flight and landing. In Figure Skating, timing counts for the transitions, the jumps and landings. Choreograph your own routine in Free Style Skating. Hot Dog Aerials push your agility to new heights. The Biathlon challenges your endurance in cross-country skiing. There's even an opening ceremony, complete with national anthems. One to Eight Players.
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Jet Combat Flight Simulator — Flight simulation programs are the most requested in the country. The key to a good one is realism, the sensation of being in the cockpit — guiding the plane through take-offs, landings and air to air — air to ground combat. You are an Air Force pilot and your mission is critical. Your success in completing your orders depends on how quickly and accurately you react. Very intense — Fantastic Graphics, animation and control elements. (Disk) List $39.95. **Sale $18.95.**

Summer Games II — The original Summer Games was last Summer's No. 1 seller. Carry on the tradition with another chance to "Go for the Gold!" Introducing Summer Games II with 8 new Olympic events including Kayaking, cycling, fencing, diving, track & field, gymnastics and equastrian. The excitement of Olympic competion is present in this new version as it was in the original. Great graphics and sound effects. This one's a winner! (1 to 8 players). (Disk)
List $39.95. **Sale $20.95.**

Movie Monster — Remember all those Saturday afternoons in front of the TV, with a big bowl of popcorn and an old Japanese monster movie? If you do then Epyx has created a program that will soon become a favorite in your software library. You choose the monster and control the outcome of the movie. The movies of the past always ended with the destruction of the monster but you can turn the tables by placing your creation in the hero role. Develop exciting plots for hours of fun. (Disk) List $39.95. **Sale $23.95.**

The New World's Greatest Baseball Game — One of the season's hottest offerings is this new enhanced baseball program. Fans can take over managing their favorite team, or create an All-Star team with players from the past or present. Two double sided disks are filled with teams, players and their stats. The graphics are improved and the team roster is the most complete that is currently available. A scoreboard will challenge your knowledge of baseball trivia. Two game modes allow you to play and manage or just manage. Fantastic. (Disk) List $34.95. **Sale $18.95.**

Super Graphics

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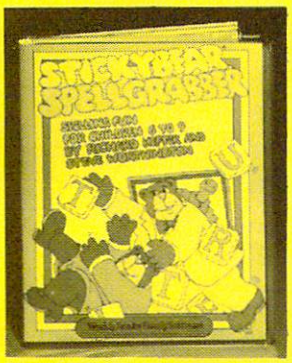
☆ ☆ Educational Programs ☆ ☆

Stickybear Typing — Stickybear makes learning the keyboard both easy & fun for anyone. A 3 game format provides different levels so that as typing skills improve so does the level of difficulty. ***Stickybear Keypress*** is geared to the needs of the child or the beginner, the stress is on the keyboard. To increase typing speed and accuracy the fast-paced ***Stickybear Thump*** will provide a real challenge. ***Stickybear Stories*** allows further practice with real text for timed practice. Everything from jokes, stories and bright amusing graphics make this one of the most delightful typing programs ever, plus you can keep track of your progress and store on disk. (Disk) List $29.95. **Sale $14.95.**



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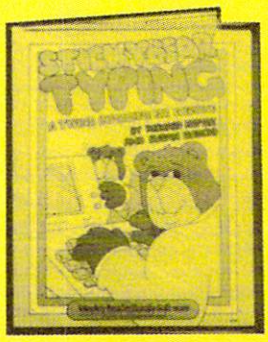

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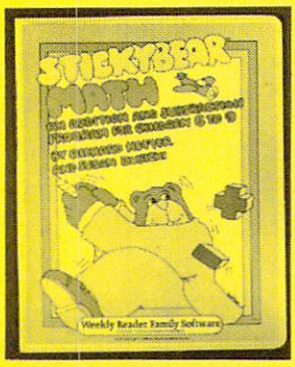

Stickybear Spellgrabber — 3 games in one: Picture Spell contains over 200 word/picture combinations. Word Spell is a scramble game, players recreate words shown on the screen. Bear Dunk involves guessing a word to save Stickybear from a dunking. (Disk) List $29.95. **Sale $14.95.**

Stickybear Math — Kids learn math skills as they help the Stickybear Family out of sticky jams. For every set of addition and subtraction problems youngsters get right, Stickybear gets a step closer to getting out of the jam. (Disk) List $29.95. **Sale $14.95.**

Stickybear Town Builder
Kids develop essential map skills as they build a town with roads, parks, airports, bridges, etc. and save on disk. That's just the first game. In Take A Drive, Compass-reading and directions are stressed. With Find The Keys, follow clues to locate mystery keys. (Disk)
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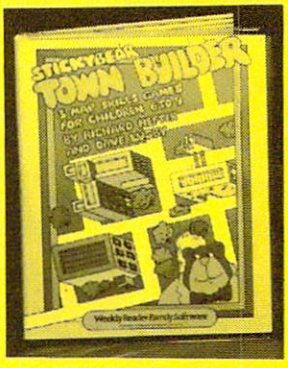

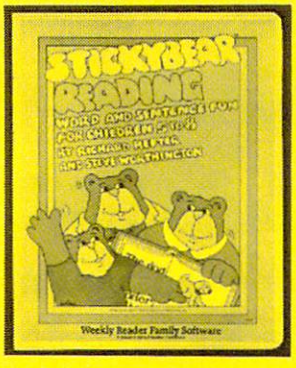

Stickybear Reading
3 fun activities that build reading comprehension skills. Match The Words: Kids practice vocabulary as they match up word and picture sets. Find The Word: Turns the words in a sentence into animated action. Build A Sentence: Children choose a subject, a verb and an object, then watch them turn into a picture. (Disk)
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Stickybear ABC — Beautifully animated pictures help children learn their ABC's and become familiar with computers. Two full-screen, full-color pictures with sound represent each letter in the alphabet. Besides helping boys and girls become familiar with computers, Stickybear ABC teaches younger children to recognize and name the letters. Older children begin to recognize words on sight. (Disk)
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Stickybear Numbers — There are colorful groups of big moving objects, such as ducks, birds and bears, that reinforce numbers and counting skills. You can use the space bar to learn to count up and down. The many possible picture combinations work to captivate youngsters with an endless variety of picture shows and give them plenty of hands on computer experience. (32 page book, disk, colorful Stickybear poster, Stickybear stickers.) (Disk) List $34.95. **Sale $14.95.**

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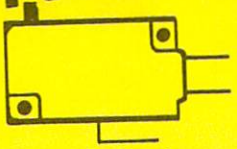

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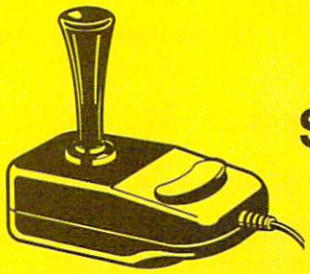

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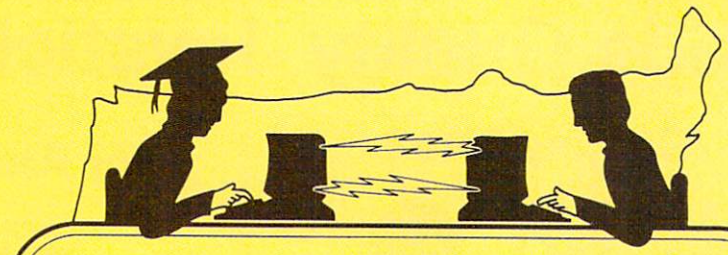

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By Dale Rupert

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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #34-1: DISTANCE FINDER

This problem was inspired by a suggestion from Yuk Hung Mak (Curacao, Netherland Antilles). The user specifies the width (W) and height (H) of a grid (such as 320 and 200 for the C-64 graphics screen). Assume the points in the grid are numbered sequentially from 1 to (W times H). The user specifies two points A and B which are each between 1 and (W times H). The computer calculates the straight-line distance between those two points.

An example will clarify the problem. If W=320 and H=200, point number 1 is in the upper left corner of the grid. The upper right corner is point number 320, since the grid is 320 units wide. Point number 321 is at the left edge of the second row, and number 640 is at the right edge of that row. The bottom left and right corners are numbered 63681 and 64000 respectively. The distance from point 1 to point 63681 is 200 (top left corner to bottom left corner). The distance from point 1 to point 320 is 320 (top left corner to top right corner). The distance from point 1 to point 64000 is 377.36 with help from our friend Pythagoras.

PROBLEM #34-2: GREASED IGPAY

We are honored with this challenge from Dr. Petrie Curryfavor, CyberCryptographer and Professor of Obfuscation, as submitted by his colleague and alter ego Eddie Johnson (Albuquerque, NM). The user enters a word, and the program translates the word into Pig Latin. The good doctor is absolutely certain that no one can beat his 95-byte, 3-line Pig Latin translator program. Urelsay omesay ofway ouyay ancay oday etterbay anthay atthay, ichtnay ahrway?

PROBLEM #34-3: DIGIT DECOMPOSITION

The user enters any positive integer up to nine digits long. Write a program to print out the individual digits and their sum. If the user enters 1234, the computer displays "1 + 2 + 3 + 4 = 10." One slight catch: no strings (except the "+" and "=") and no string functions are allowed. Still an easy problem, isn't it?

PROBLEM #34-4: SIX COUPLES

Here's a good one from around the world, submitted by Necah Buyukdura (Ankara, Turkey). Using the first letters of the first names of twelve people (six couples), we are told:

C, F, P, Q, and T are YOUNGER;
A, D, E, F, and Q are TALLER;
D, P, Q, S, and T are DARKER;
and A, C, P, S, and U are SLIMMER than their spouses.

(B and R are not mentioned above.)

Write a program that will deduce and then print six pairs of letters, each pair giving the first name initials of each couple.

We received several good explanations for the "PRINT CHR$(34)" puzzle/bug mentioned at the end of the June *Commodares*. The problem was to explain why

```
PRINT MID$(CHR$(34),1);2;3
```

prints reverse-video right brackets after the two and the three. The explanation is that printing CHR$(34) puts the computer into the "Quote/insert" mode. In this mode, cursor movements show up as special symbols. In particular the cursor-right mode is a reverse-video right bracket. When the computer prints the number "2," it prints a space where the optional minus sign might be in front of the digit, and it also prints a cursor-right character after the digit so that there is a gap between a number and whatever follows it.

Try this example from Art Shipman (Westbrookville, NY). Move up to the line just above the READY on your

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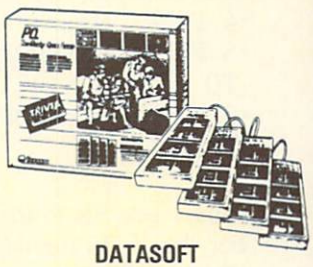

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screen. Type in direct mode PRINT 1"X" and press <RETURN>. You now see " 1AXY." where "READY." was. The "RE" is replaced by the leading space and the digit. The "A" is skipped over by the cursor-right, and the "X" is printed.

Art sent the following program to provide further insight into how the Quote mode works.

```
•1 REM QUOTE MODE DEMO BY ART SHIPMAN
•2 PK=244 : IF LEN(DS$)=0 THEN PK=212
•3 Q$=CHR$(34)
•4 PRINT Q$;PEEK(PK);:GOTO 4
•5 PRINT Q$;:POKE PK,0:PRINT PEEK(PK);:GO
 TO 5
•6 PRINT Q$;:POKE PK,1:PRINT PEEK(PK);:GO
 TO 6
```

Line 1 sets PK to the address of the Quote mode flag. For the C-128 the address is 244. If DS$ has a length of zero, then the program is being run on the C-64, and PK is changed to the appropriate value of 212. Q$ is a quotation mark. Line 4 is executed repeatedly until you press the RUN STOP key. You will see the quotation mark followed by the current value of the Quote mode flag (1) and the right bracket discussed above. The next time line 4 is executed, another quotation mark is printed followed by the number zero (without the right bracket), indicating that the computer is no longer in the Quote mode.

Press RUN STOP and type GOTO 5. This line repeatedly takes the computer out of Quote mode by POKEing 0 into address PK. No more right brackets are displayed. Press RUN STOP again and type GOTO 6. Now the computer is consistently put into Quote mode, and the " 1]" is continuously displayed. Art even suggested a reason for the use of the right bracket. In the *1541 User's Manual* under the PRINT# section, it mentions that CHR$(29) is used as a delimiter between numbers in sequential files. A trailing space would be indistinguishable from a leading space, so a different character (the right bracket) is used. Change the semicolons after Q$ to commas in lines 4, 5, and 6 and you will see a string of right brackets corresponding to the number of cursor-rights inserted by the computer to move the cursor to the next tab column. Thanks to Art as well as to Harold Garter (Phoenix, AZ), Rick Rothstein (Trenton, NJ), Charles Grady (Cleveland, TN), and Jim Speers (Niles, MI) for all this information. After running the program above, predict or explain the output from PRINT Q$,C if you can. Hint: The 0 corresponds to the value of C.

Back to reclaim his title for the "World's Longest Listable Line" is James Borden (Carlisle, PA). Jim's program for the C-64 includes a machine language patch to the LIST code to allow lines longer than 256 characters. His program copies BASIC from ROM into RAM in order to change the LIST code. Then it fills memory with a one-line program consisting of a line number, three zero bytes at the end, and 38,904 "RESTORE" tokens (hex BC). A SYS call causes this Superline to be listed. By Jim's calculations, it is 272,337 characters in length and requires six minutes to list. If you are interested in Jim's machine language routine and BASIC program, send me a self-addressed, stamped envelope, with your request clearly stated, to *Commodares*.

Now on to the *Commodares* from the June issue. All of the solutions to *Problem #30-1: Functional Entry* used the dynamic keyboard technique. The problem suggested by Glen Bohusch (Erie, PA) was to allow the user to run a program, type an expression for a user-defined function, and have the program evaluate that function for various values. The solution from S. Simonetti (Glen Rose, TX) is listed below.

```
•1 REM COMMODARES PROBLEM #30-1:
•2 REM   FUNCTIONAL ENTRY
•3 REM SOLUTION BY
•4 REM     S. SIMONETTI
•5 REM
•8 K1=842 : CT=208 :REM  KBD BUFFER
•9 IF LEN(DS$)=0 THEN K1=631 : CT=198
•10 PRINT"DEFINE THE FUNCTION FNA(X) = "
•20 INPUT A$
•30 PRINT"[CLEAR][3"[DOWN]"]50 DEF FNA(X)
 ="A$ : PRINT"GOTO50[HOME]"
•40 POKE K1,13:POKE K1+1,13:POKE CT,2:END
•100 FOR X=1 TO 10 : PRINT FNA(X) : NEXT
```

This program runs on the C-64 and the C-128. The keyboard buffer and queue counter are in different locations in the two machines. Line 8 assumes a C-128 is being used. If the program is run on a C-64, line 9 changes the start of the keyboard buffer variable and the queue counter to their proper values. The variable DS$ is a special disk status variable for the C-128 only. On the C-64 it is normally a null string.

Line 30 positions the cursor and prints the function definition on the screen with the GOTO 50 statement below it. Line 40 stuffs the keyboard buffer with two Return codes and tells the queue counter that there are two characters waiting. When the program ends in line 40, the two Returns are processed. The first enters the new line 50, and second causes the program to GOTO 50 where the function is defined and execution continues.

Other readers went to the trouble of printing the added screen lines in the background color so that line 50 and the GOTO 50 were invisible. Jim Speers (Niles, MI) suggested adding these lines to do that for the C-64:

```
25 POKE251,PEEK(646):POKE646,PEEK(53281)
55 POKE646,PEEK(251)
```

For the C-128, replace the 646 with 241. Line 25 saves the current character color whose value is in location 646 (241 on the C-128) and replaces it with the background color whose value is in address 53281. Line 55 restores the original color. Location 251 is an available zero page RAM address. On the C-64, the original color value must be stored in RAM rather than in a variable, since variable values are lost when line 50 is added to the program.

Problem #30-2: What Environment turned out to be too much of a challenge for everyone except Jim Speers (Niles, MI). Jim's solution is printed below.

```
·1 REM COMMODARES PROBLEM #30-2:
·2 REM      WHAT ENVIRONMENT?
·3 REM SOLUTION BY
·4 REM      JIM SPEERS
·5 REM
·100 DIM C$(32):FORI=1 TO 32:READ C$(I):N
 EXT
·110 DATA BLACK,WHITE,RED,CYAN,PURPLE,GRE
 EN,BLUE,YELLOW,ORANGE,BROWN,LIGHT RED
·120 DATA DARK GRAY,MEDIUM GRAY,LIGHT GRE
 EN,LIGHT BLUE,LIGHT GRAY,BLACK,WHITE
·130 DATA DARK RED,LIGHT CYAN,LIGHT PURPL
 E,DARK GREEN,DARK BLUE,LIGHT YELLOW
·140 DATA DARK PURPLE,DARK YELLOW,LIGHT R
 ED,DARK CYAN,MEDIUM GRAY,LIGHT GREEN
·150 DATA LIGHT BLUE,LIGHT GRAY
·160 Z=FRE(1)-65536*(SGN(FRE(1)<0)):IFZ>4
 0000 THEN 190
·170 IF Z<37000 THEN 260
·180 GOTO 250
·190 PRINT"COMMODORE 128":X=RGR(0)
·200 IF X>=5 THEN PRINT"80 COLUMN MODE":P
 RINT"SCREEN COLOR= ";C$(16+RCLR(6)):GOTO
  300
·210 IF X=0 THEN PRINT"40 COLUMN MODE":PR
 INT"PRINT COLOR= "C$(RCLR(5)):GOTO 280
·220 IF X>0 AND X<5 THEN PRINT"BIT MAP MO
 DE":GOSUB 310:END
·230 PRINT"BORDER COLOR= ";C$(RCLR(4))
·240 PRINT"PRINT COLOR= ";C$(RCLR(5))
·250 PRINT"COMMODORE 64":PRINT"40-COLUMN
 MODE":GOTO 270
·260 PRINT"VIC 20":PRINT"20-COLUMN MODE"
·270 PRINT"PRINT COLOR= ";C$((PEEK(646)AN
 D15)+1)
·280 PRINT"SCREEN COLOR= ";C$((PEEK(53281
 )AND15)+1)
·290 PRINT"BORDER COLOR= ";C$((PEEK(53280
 )AND15)+1):IF X<>5 THEN END
·300 PRINT"PRINT COLOR= ";C$(RCLR(5)+16):
 END
·310 CHAR1,0,1,"COMMODORE 128":CHAR1,0,2,
 "BIT MAP MODE"
·320 X$="BORDER COLOR= "+C$(RCLR(4)):CHAR
 1,0,3,(X$)
·330 X$="SCREEN COLOR= "+C$(RCLR(0)):CHAR
 1,0,4,(X$)
·340 X$="PRINT COLOR= "+C$(RCLR(1)):CHAR1
 ,0,5,(X$):CHAR1,0,6,STR$(RGR(0))
```

The problem was to write a program which could determine the type of computer as well as the operating modes and screen colors of the computer on which it is being run. Since the program contains some of the new C-128 commands, it gives a SYNTAX ERROR when LISTed on a C-64, but it will run on a VIC 20 and a C-64 (as well as a C-128), since the offending lines are never executed on those machines. Notice how Jim determined the type of computer in lines 160 and 170. The amount of free memory is the key. If this is part of a long program, the numbers in those lines might have to be changed. Lines 310 through 340 allow this program to handle even the C-128 bit-map mode. If you are writing software that may be run on various machines, you should consider using some of the ideas of this program.

We received several good solutions to *Problem #30-3: Word Wrapper* which was originally submitted by Jim Speers. Of all the solutions, Jim's own solution is the most versatile. It is listed below.

```
·1 REM COMMODARES PROBLEM #30-3:
·2 REM      WORD WRAPPER
·3 REM SOLUTION BY
·4 REM      JIM SPEERS
·5 REM
·10 L$="[LEFT]":B$=" ":FORI=1TO79:LL$=LL$
 +L$:BL$=BL$+B$:NEXT:D$=CHR$(20)
·20 Q$=CHR$(34)+CHR$(20)+CHR$(34):WL=0:LL
 =0:C$="[c P]":PRINT"[CLEAR][DOWN]"C$;
·30 GETZ$:IFZ$="" THEN 30
·40 IF Z$="[BACKARROW]" THEN PRINT L$;B$:
 END
·50 X=ASC(Z$):IF X=32 THEN WL=0:W$="":LL=
 LL+1:PRINT L$Z$C$;:GOTO 140
·60 IF X=34 THEN PRINT L$Q$C$;:WL=WL+1:LL
 =LL+1:WL$=WL$+Q$:GOTO 140
·70 IF X=13 THEN PRINT L$B$:PRINT C$;:LL=
 0:WL=0:W$="":GOTO 30
·80 IF X<>20 THEN 120
·90 PRINT D$D$C$;:LL=LL-1:IF WL>0 THEN WL
 =WL-1:W$=LEFT$(W$,LEN(W$)-1)
·100 IF LL<0 THEN LL=LL+80
·110 GOTO 30
·120 IF (X>16ANDX<32) OR (X>127ANDX<160)
 THEN 30
·130 PRINT L$Z$C$;:W$=W$+Z$:WL=WL+1:LL=LL
 +1
·140 IF LL<81 THEN 30
·150 IF WL=0 THEN 30
·160 PRINT LEFT$(LL$,WL+1)LEFT$(BL$,WL-1)
 W$C$;:LL=WL:GOTO 30
```

The versatility comes from the fact that there are no PEEKs or POKEs, and no assumptions about screen memory locations. Consequently it is very easy to adapt Jim's program for screens of any width. To use this on the C-128 with an 80-column screen, just make these changes:

Line 10: change 39 to 79 (one less than screen width)

Line 100: change 40 to 80 (equal to screen width)

Line 140: change 41 to 81 (one more than screen width)

Jim uses the <BACK ARROW> as the escape key for

this program. Press it when you are done typing.

Other very good solutions to this problem were from Paul Sobolik (Pittsburgh, PA), Steven Steckler, and Ben Margolin (Detroit, MI). Congratulations to Ben and the rest of the computer team at Renaissance High School who are three-time city champs, and who made it to the international championships in Detroit this year.

It was easy to separate the correct solutions from the incorrect ones to *Problem #30-4: Color Bars.* The readers who felt that it was very likely for the screen to eventually be filled with one color generally misinterpreted the problem. The length of each character bar to be printed was determined by the greatest number of consecutive repetitions of any one color previously chosen, where colors were randomly chosen from 16 possibilities. Until two consecutive matching colors are randomly chosen, color bars are printed singly. After the first occurrence of two consecutive matching colors, color bars are each printed two characters in width. This continues until three consecutive matching colors are chosen, after which color bars are printed which are each three characters wide. And so forth.

The solution from Bing Perry (Monterey, CA) is listed below.

```
•1 REM COMMODARES PROBLEM #30-4:
•2 REM      COLOR BARS
•3 REM SOLUTION BY
•4 REM      BING PERRY
•5 REM
•10 CLMEM=241 : IF LEN(DS$)=0 THEN CLMEM=
 646
•20 PRINT CHR$(147);:HLD=0:REP=1:CTR=1
•30 RNR=INT(RND(0)*16)
•40 POKE CLMEM,RNR:FOR I=1 TO REP:PRINT C
 HR$(65+RNR);:NEXT
•50 IF RNR=HLD THEN CTR=CTR+1:GOTO 70
•60 CTR=1
•70 IF CTR>REP THEN REP=CTR
•80 HLD=RNR : GOTO 30
```

It is representative of most of the correct solutions. Bing's program displays colored letters, for easier interpretation. Most readers used "<RVS ON><SPACE><RVS OFF>" as the color bar character. In the program above, HLD is the last color selected; REP is the greatest number of repetitions so far; CTR holds the current number of repetitions of the selected color; and RNR is the current number from the random number generator.

Line 10 allows the program to be run on the C-128 and the C-64. The character color memory location is 241 on the C-128 and 646 on the C-64. C-128 users may want to add PRINT "<CONTROL-G>" at the end of line 70 so that the computer beeps whenever the color bar length changes.

True to form, Jim Speers did an interesting analysis of the likelihood of the screen ever being one color. The color bar must reach a length of 32 for the screen to be a solid color, since 32*32 is greater than the 1000 characters needed to fill the screen. That means that the same random number must occur 32 times in a row, and that's not very likely at all. Based upon some preliminary timing and the results of a simulation program he wrote, Jim concluded that it would take on the order of 10^{28} years (that's one with 28 zeros after it) on the average for the screen to be one color. Jim points out that this assumes the random number generator is truly random. In actuality it generates a very large but finite group of numbers. If in that group there is no occurrence of 32 consecutive numbers which are the same, the solid color screen will never happen.

Alain Goyette (Gander, Newfoundland) wrote an assembly language program to solve this problem. He and Scott Nicodemus used the random noise generator of the SID chip to generate random numbers as described in *Tips Ahoy!* in the June issue. In BASIC,

```
POKE 54287,255 : POKE 54290,128 : R=PE
EEK(54299)
```

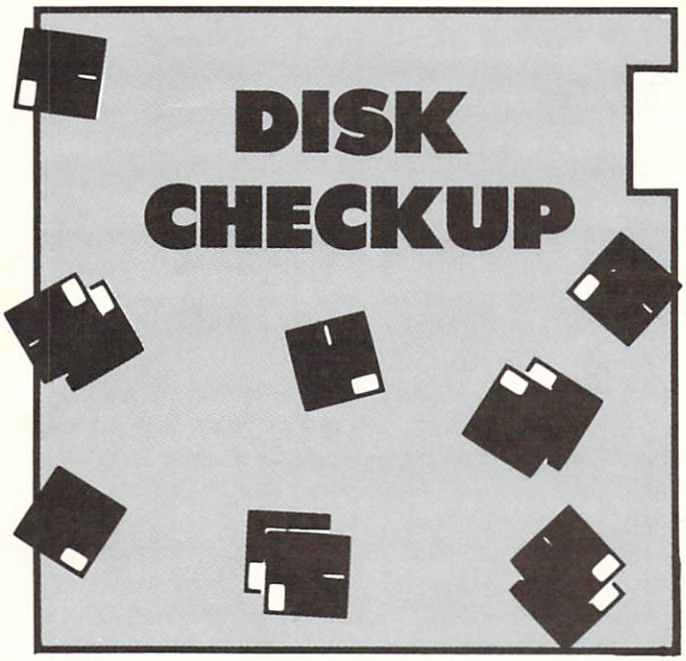
selects a random number R from 0 to 255. Scott used R=(PEEK(54299) AND 15) to choose his random numbers from 0 to 15. Alain ran his BASIC program for three days and never got a color bar of length greater than five. His assembly language program did better with a length of 13.

Jim Speers concluded that a VIC 20 using only two possible colors on its 22 by 23 screen should produce a solid-colored screen in only 29¼ hours. With the eight colors of the VIC, waiting for a color bar 23 characters long should take a mere 46,000,000 years.

Congratulations also to these readers not already mentioned this month: Dean Holmes (St. Petersburg, FL), Will Ludwigsen (Port Charlotte, FL), Karen Middaugh (San Diego, CA), Mark Breault (Brandon, MAN), Daniel Brumbaugh (Chambersburg, PA), Michael Jacknis (Dix Hills, NY), Craig Ewert (Crystal Lake, IL), Pete Baker (Rio Oso, CA), Tony Mannucci (Berkeley, CA), and Jimmy Wong (San Francisco, CA).

One final challenge. Paul Sobolik (Pittsburgh, PA) used the dynamic keyboard to solve *Problem #30-1: Functional Entry,* just as everyone else did. Paul said he worked on trying to devise a way to POKE the definition of the function into the program text, but he found the task of tokenizing too complex. He asked if there is a way to use BASIC's CRUNCH ROUTINE (at $A579 in the C-64) to do this. Or how about writing the string defining the function to a disk file and then merging it with the rest of the program? Any thoughts and examples you can come up with will be appreciated.

Don't wait around for your screens to fill with color bars. Get busy on this month's challenges. If these are too easy for you to bother with, send us some harder ones. If these are too hard for you to figure out, send us some easier ones that you have solved. See you next month. □



For the 1541 and the C-64, Plus/4, C-16, and VIC 20 (+8K)

By Donald Fulton

What with the bugs that seem to inhabit the Commodore DOS, it pays to periodically check the health of your files. It's not too well known that there is enough redundancy in the Commodore DOS to allow files to be checked very thoroughly. For example, the number of Blocks Free on the disk can be figured three ways: from the directory, from the BAM, and from the actual files. *Disk Checkup* displays all three. In a healthy disk all three should agree. An exception is some commercial disks that may use a nonstandard BAM or directory.

Disk Checkup, however, does much more than display three Blocks Free. It thoroughly checks each file in the directory. In testing this program on three of my heavily used working disks, which contained about 150 files, I found three previously undetected problem files. *Disk Checkup* first displays an expanded directory, including the starting track and sector of each file, and then checks that all files start at different track and sectors. This is a quick check that will detect the most common DOS file error: two directory entries pointing to the same file.

Disk Checkup then proceeds to trace each file. If the traced block count does not agree with the directory block count, the file is displayed in inverse video. The directory block count was the number of blocks in the file when it was saved, so if the block counts disagree, either the file is a different file than shown in the directory, or part of the file has been lost.

Disk Checkup will detect any case of file overlap, including partial overlap, because it checks each block for overlap during the trace. If a problem is found, the overlapping files are identified. Unlike Validate, *Disk Checkup* will not abort if it encounters an illegal file link, i.e. a link to a nonexistent track or sector. If it encounters an illegal link during a trace, it prints an illegal link message, and continues with the next file.

It is not necessary to monitor *Disk Checkup* while it works, since tracing all the files on a full disk can take a few minutes. On the final screen *Disk Checkup* displays a full status report on the disk files and three Blocks Free. To bring a problem disk back to health, a general guideline is to first Validate (Collect) the disk, delete any problem files, and Validate again.

Disk Checkup is safe to run on all disks because it does not write to the disk. If a disk contains REL files, they may be incorrectly identified as problem files, because REL files use a different directory format from PRG, SEQ, or USR files. *Disk Checkup* is written in 2.0 BASIC in a structured format, yet with an eye to speed. The program includes many REM statements that may be omitted if desired. ☐ *SEE PROGRAM LISTING ON PAGE 128*

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Reader Service No. 123

S.O.S.

By Tim Little

My friends and I write BASIC programs, and we have heard of tricks and techniques that will allow our programs to run faster. Using these techniques, is it possible to write arcade-speed games without machine language? Also, could you tell us what kind of techniques we could use to speed up our BASIC programs?

Due to the way the BASIC language is translated by the C-64 and C-128, commercial quality animated action games are very difficult to implement successfully. BASIC is interpreted statement by statement, each statement taking possibly dozens of machine language steps to execute, not including the time or effort the BASIC interpreter spends just parsing (decoding) your program line into separate byte-sized pieces. The most efficient method of programming such a game would be to use machine language (actually assembly language would be the correct term, but the two are more or less interchangeable) which is not as difficult as you may think. So to answer your first question, arcade speed games are extremely difficult if not impossible without at least some machine language routines.

As for your second question, I will just list the techniques, as an explanation would be far too lengthy to print on this page:

1) Use variables instead of numbers whenever possible. For example:

```
AD = PI * RD
```

will execute much faster than

```
AD = 3.14 * 15
```

2) Put all commonly used subroutines in the beginning of your program. This is probably the opposite of what you were taught, and will require extensive rewriting of your program, but if you are trying to write fast code this is a must.

3) Replace the number 0 (zero) with a period (.).

4) Integers are supposed to run faster than floating point numbers, but timing program execution proves this to be false. So use floating point, even though the latter may use more memory.

5) While using FOR/NEXT loops, don't name the variable of the loop after the NEXT—it was intended to be optional on most home micros. An example should clear up any problems:

```
FOR X = 1 TO 1500 : NEXT
```

will run faster than

```
FOR X = 1 TO 1500 : NEXT X
```

That last X slows it down.

6) Lastly, remove all REMs and extra spaces, and put as much text on one line as possible.

All of the above is technically known as bad programming technique, but it works.

Seeing so many programs in all the Commodore magazines, I wondered what the formula for converting the SYS, PEEK, and POKE addresses from the C-64 to the C-128 would be.

Unfortunately, the simple answer is that ~~no~~ such formula exists. Although from a logical standpoint, it might seem that one would just multiply every address by two and let the program go at that, this just won't work.

The C-64 has ROM from $A000 to $BFFF and from $E000 up. Saved within the ROM is the operating system, the program that controls every function of the C-64 from checking the keyboard for recent input to interpreting your BASIC programs. The ROM is a machine language program and even has variables that can be easily changed by a programmer. Since the C-64 and the C-128 don't have identical operating systems, and because of the myriad of differences between the two machines, a formula is impossible.

What you can do is consult a memory map, a book that describes the function of most of the addresses in a specific machine, for both machines and look for similar labels (a label is a six letter name given to an address or routine) or functions for the given address.

ERRATUM

ESCAPE FROM SKULL CASTLE (July '86)

Five @ symbols were missing from the end of line 618 as printed. The error will cause an incorrect *Bug Repellent* code to be printed for that line, but will cause no other problems. To generate the correct *Bug Repellent* code, enter the line as follows:

```
618 PRINTTAB(21)"[RVSON][BLACK]NOP[RVSOF
F] [RVSON]QR[BLUE][3"@"][BLACK]@[BLUE][6
"@"]
```

Also, several readers reported incorrect *Bug Repellent* codes for all the data statement lines (1000-1178). This will occur if a user types in any line within the program with an incorrect number of quotation marks.

VAULT OF TERROR

Continued from page 61

Wand: battles magic with magic. Good for those invisible walls you keep slamming into, or hitting spirits.

Key: unlocks doors. You must be facing a door to unlock it. If the door opens, you will hear a hiss, or a beep if it is still locked.

Gold: heavy stuff. Need it to win the game, but you may have to drop it to get everything up that ladder.

Crown: you have to be clever indeed to find the hidden location of this treasure.

Not long after you enter the dungeon, you're sure to meet one of its intelligent, nasty inhabitants—either by running into one of them, or one of them coming looking for you. Your human scent is a dinner bell for the creatures in the dungeon. They are as follows:

Brown Recluse: this spider is a skinny little varmint who is usually carrying a torch, a remnant of the adventurer he had for breakfast. A stroke of the sword or a few raps with the torch will usually kill him, but don't underestimate him. He might get a lucky shot.

Red Tarantula: a deadlier cousin of the Recluse. Carries a sword. A wee bit faster on the draw.

Blue Crypt Rat: carries a shield in his junkpack. Possibly lethal teeth and claws.

Brown Carrion Rat: carries the ring, but doesn't know how to use it; he pulled it off a skeleton. Bigger, badder.

Purple Goblins: the original inhabitants of the dungeon before the Naga arrived. There are only two left alive; the rest perished at the hands of the serpents. Each carries a rope on his backpack and is armed with a scythe and a short sword. Don't fight these guys until you are ready. They wander around on the first level, looking for overzealous newcomers to carve up.

Light Blue Revenant: ghastly undead spirit, a corpse brought to life by the Emperor Naga's sorcery. He has the power of the "Cold touch"—he changes inorganic and organic material into the energy he needs to retain his existence on this plane. May not be fooled by the ring! These horrid friends will take your possessions if they succeed in touching you, and hoard them in a secret and usually well-guarded area of the dungeon.

Green Naga: giant cobra. Fast and powerful. A single hit from this snake can kill you if you are weak.

Emperor Naga (silver): this guy is the worst. He strikes as fast as you do and does more damage. You will have to be either lucky or smart to defeat him. (Hit and run is best.) He will be carrying a sack of gold, but he has hidden his favorite treasure, the crown, somewhere in the dungeon maze.

All of these monsters can be defeated in mortal combat, even the Revenant, but you will find that the wand is a better weapon against the Revenant than the sword.

You can fight and move in the dark, but you will find it much to your advantage to use the torch or the ring for visibility rather than stumble around in blackness. Torches burn for quite some time, but after a while you will see the outline of the dungeon growing dimmer, turning from light grey to medium grey to dark grey to blue and finally black. To replenish the torch you are carrying, drop it, walk away from it until you are in darkness, and turn around, go back, and pick it up again. When you use it the torch will burn brightly again. If the torch should go out on you, your situation is pretty hopeless unless you have placed other torches in strategic locations or you find one accidentally. (The ring could help you get out of a tight situation like this.)

When you do decide to engage a monster in combat, you and he must occupy the same square. You can move forward past a monster, and he can sometimes do the same to you. When you hear the creature's cry, he has entered the same block as you. You can now engage him in battle with your bare hands, torch, or the sword if you have it. The sword is a superb weapon, doing four times the damage of a torch or your bare hands. If you are empty-handed, you will still be able to do slight damage to monsters by pressing the joystick button, even enough to kill one if you are fortunate to hit him enough times!

Merely possessing the shield gives you its protection, so you will never need to use it, only have it, for it to protect you. A flash of red will let you know when you have been wounded. The screen flashes pink when you are lightly struck, orange when you are hit soundly, and dark red when you are gravely wounded. You will know when you strike your opponent by the flash of green and the sound of your slashing blade.

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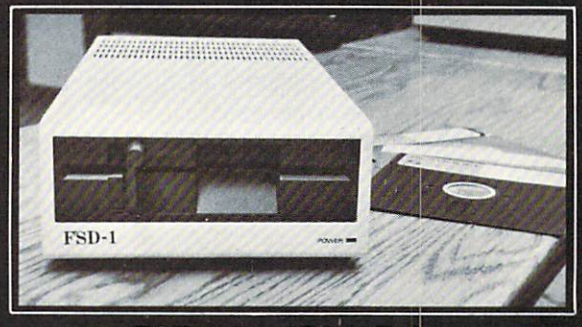

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If you are hale and well, the border is black. When you are severely wounded, the border turns yellow. When you are within a single stroke of death, the border turns red. However, the greatest advantage you have over the monsters is that your wounds can heal, while theirs are cumulative until they are killed. Good strategy can entail hitting a creature several times, running away and resting for a while (until the border turns to yellow or black again), and coming back to deliver the death blow.

You do not have to hit the joystick button repeatedly to keep slashing with the sword, simply hold it down to keep raining blows—but a friend of mine claims you can time the strokes better if you keep popping the button.

You grow stronger by spending time in the dungeon and by killing other creatures. Don't take on a creature outside your capabilities, or descend to the maelstrom of the second level, until you are strong enough!

The first level is rather easy—you may be killed several times before you get the hang of it, but eventually you should be able to kill anything with a few blows on the first level. When you are strong enough and you have the rope, you can go down to the serpent's lair, the second level. The second level is the stronghold of the Emperor Naga and his evil servants.

Stand on a block that has an open shaft leading down, HOLD the rope (should be lit in yellow), and press the button. You will hear your descent, and the next screen that appears will be a view with a ceiling exit above you somewhere on the second level. To go back up, you stand on a block that has both a ladder and a ceiling exit, holding the rope, and press the button. You will hear your ascent, and you will be back on the first level. You cannot go up when there is a ceiling exit only, with the exception of the first one you saw when the game started, which is the one you leave through to win the game!

You will notice that the game has true three dimensional graphics, with the creatures closest to you obscuring the ones behind them—and if you look you will even see creatures behind ladders.

In your search for the crown, you will see rooms, coffins, ladders, shafts, and ceiling exits. The coffins cannot be opened. Ladders that stand vacant in corridors are exits to the surface that were sealed off by the Naga. You cannot climb up them without an exit above them.

The rooms are the most puzzling of obstacles. All rooms have four doors. Although a door can be locked from the outside, keeping you out, you can always leave from the inside of a room in any direction if there is a corridor outside that way. The doors are self-latching, however, and will remain locked behind you until you unlock them with either the key or the wand. Then you can pass freely through the door both ways. Because the view of a door from the inside of a room looks identical no matter which direction you face, the only way you can tell you have turned inside a room is the flash of the command bar and a change in your direction indicators. If you are inside a room and you hear a beep when you try to go through a door, indicating it is impassable, it is for one of two reasons: there is a stone wall on the other side, or the door is rusted shut and cannot be opened by (hint) earthly means. When you are outside and hear a beep, the door is merely locked. (Use the key.)

The most confusing obstacle in the dungeon is the invisible barrier, conjured up by the Emperor Naga to protect something of value to him. Some of these are one-way obstacles—you can walk through them but not back. The only thing that can smash these barriers is the wand, carried by the Revenants. It is not possible to win the game without passing through at least one of the barriers. When you are walking around and you suddenly hear a bump, you have walked into an invisible barrier.

There are multiple partitions on each floor, and you may have to go down, then come up again, or even go down again to get to them. It can get very confusing, and it is helpful to map the dungeon extensively in your travels. A friend can do this while you battle the monsters, or you can do it yourself.

Avoid the spirits at all cost! The Revenants can steal all your possessions with a single touch, even when you have the ring on. Sooner or later, however, you will have to kill one to get a wand. Do it wisely, by slashing and then moving back. If you stand toe to toe and slug it out he is sure to get your equipment before he expires.

When you get the crown and have brought all the objects on the command bar to the first floor, go to the original space you started in, under the ceiling exit you dropped down into the vault through, and USE the rope to win the game! Only when you have everything (all objects on the command bar lit in light red) can you exit and win the game.

There is a great deal more I could hint about, but I think half the fun of the game is solving the riddles in it and discovering the secret location of the crown. I leave the heavy exploration up to you. The game is seriously addictive, which I noted when I let several of my friends play it, and most of them yearned to break into the source listing and deduce the secrets of the *Vault*. For this reason I disabled the RUN STOP and RESTORE keys, as well as LIST, while the game is running.

I challenge you to win the game fairly. I think you will find it every bit as simultaneously frustrating and exhilarating as *Zork* itself! The save feature of the game allows you to set aside a game and come back to it, so you can play it for weeks before winning it, and I think even then you will return to the *Vault* for regular sojourns.

To use the load feature, hit f2 at the prompt on the title screen and enter the name of the file you wish to load. The filename must be 11 letters or less. If you hit RETURN with no input, the load will default to "LASTDUNGEON". The last game will be loaded, if you saved a game the last time you played. To save a game, go to the command bar at any time during the course of a game and hit f8. The current game will be saved to disk for you under the name "LASTDUNGEON". The reason the load feature asks you for the name of the file is that I plan to create new dungeon files if this game meets with reader approval. In that event, you will be able to enter the name of the new file to load in, instead of "LASTDUNGEON", and play a whole new version of the game with a new floorplan and new puzzles to solve! □ *SEE PROGRAM LISTING ON PAGE 120*

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type		You Will See
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑ CRSR ↑	
[DOWN]	Cursor Down		↑ CRSR ↑	
[LEFT]	Cursor Left	SHIFT	←CRSR←	
[RIGHT]	Cursor Right		←CRSR←	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	
[BACKARROW]	Back Arrow		←	
[PI]	PI		π	
[EP]	English Pound		£	

When You See	It Means	You Type		You Will See
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent*. (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```
·100 FOR X = 49152 TO 49488:READY:S=S+Y                          AB
·110 IF Y<0 OR Y>255 THEN 130                                    EA
·120 POKE X,Y:NEXT:GOTO140                                       ID
·130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN
]PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END                     ID
·140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
-500":END                                                        HJ
·150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
KE646,1                                                          NP
·160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
TALLED[6" "]"                                                    LF
·170 DATA32,161,192,165,43,133,251,165,44,133                    DL
·180 DATA252,160,0,132,254,32,37,193,234,177                     DB
·190 DATA251,208,3,76,138,192,230,251,208,2                      OF
·200 DATA230,252,76,43,192,76,73,78,69,32                        KN
·210 DATA35,32,0,169,35,160,192,32,30,171                        CA
·220 DATA160,0,177,251,170,230,251,208,2,230                     CE
·230 DATA252,177,251,32,205,189,169,58,32,210                    JE
·240 DATA255,169,0,133,253,230,254,32,37,193                     CL
·250 DATA234,165,253,160,0,76,13,193,133,253                     NB
·260 DATA177,251,208,237,165,253,41,240,74,74                    MB
·270 DATA74,74,24,105,65,32,210,255,165,253                      EP
·280 DATA 41,15,24,105,65,32,210,255,169,13                      GH
·290 DATA32,220,192,230,63,208,2,230,64,230                      AN
·300 DATA251,208,2,230,252,76,11,192,169,153                     NG
·310 DATA160,192,32,30,171,166,63,165,64,76                      BF
·320 DATA231,192,96,76,73,78,69,83,58,32                         EP
·330 DATA40,169,247,160,192,32,30,171,169,3                      PJ
·340 DATA133,254,32,228,255,201,83,240,6,201                     FK
·350 DATA80,208,245,230,254,32,210,255,169,4                     FL
·360 DATA166,254,160,255,32,186,255,169,0,133                    CL
·370 DATA63,133,64,133,2,32,189,255,32,192                       GC
·380 DATA255,166,254,32,201,255,76,73,193,96                     NN
·390 DATA32,210,255,173,141,2,41,1,208,249                       NH
·400 DATA96,32,205,189,169,13,32,210,255,32                      IM
·410 DATA204,255,169,4,76,195,255,147,83,67                      KC
·420 DATA82,69,69,78,32,79,82,32,80,82                           DC
·430 DATA 73,78,84,69,82,32,63,32,0,76                           ML
·440 DATA44,193,234,177,251,201,32,240,6,138                     GN
·450 DATA113,251,69,254,170,138,76,88,192,0                      JK
·460 DATA40,0,0,230,251,208,2,230,252,96                         NA
·470 DATA170,177,251,201,34,208,6,165,2,73                       DM
·480 DATA255,133,2,165,2,208,218,177,251,201                     JA
·490 DATA32,208,212,198,254,76,29,193,0,169                      FM
·500 DATA13,76,210,255,0,0,0                                     PA
```

COMMODORE 128 VERSION

```
·100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
:S=S+Y:TRAP110:NEXT:SLOW                                         IH
·110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
**ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
S 140-390":END                                                   JA
·120 PRINT"[CLEAR][DOWN]  C-128 BUG REPELLENT
INSTALLED"                                                       II
·130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"                      IN
·140 DATA 32,161,12,165,45,133,251,165,46,133,
252,160,0,132,254,32,37                                          OF
·150 DATA 13,234,177,251,208,3,76,138,12,230,2
51,208,2,230,252,76,43                                           NC
·160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
,12,32,80,13,160,0,177                                           OL
·170 DATA 251,170,230,251,208,2,230,252,177,25
1,32,89,13,169,58,32,98                                          EF
·180 DATA 13,169,0,133,253,230,254,32,37,13,23
4,165,253,160,0,76,13                                            JO
·190 DATA 13,133,253,177,251,208,237,165,253,4
1,240,74,74,74,74,24                                             LC
·200 DATA 105,65,32,98,13,165,253,41,15,24,105
,65,32,98,13,169,13,32                                           DE
·210 DATA 220,12,230,65,208,2,230,66,230,251,2
08,2,230,252,76,11,12                                            GM
·220 DATA 169,153,160,12,32,80,13,166,65,165,6
6,76,231,12,96,76,73,78                                          CP
·230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
3,169,3,133,254,32,107                                           HC
·240 DATA 13,201,83,240,6,201,80,208,245,230,2
54,32,98,13,169,4,166                                            GK
·250 DATA 254,160,255,32,116,13,169,0,133,65,1
33,66,133,250,32,125,13                                          LB
·260 DATA 32,134,13,166,254,32,143,13,76,73,13
,96,32,98,13,165,211                                             JF
·270 DATA 234,41,1,208,249,96,32,89,13,169,13,
32,98,13,32,152,13,169,4                                         GD
·280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
9,82,32,80,82,73,78,84,69                                        PL
·290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
01,32,240,6,138,113,251,69                                       OK
·300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
,208,2,230,252,96,170,177                                        FJ
·310 DATA 251,201,34,208,6,165,250,73,255,133,
250,165,250,208,218,177                                          GA
·320 DATA 251,201,32,208,212,198,254,76,29,13,
0,169,13,76,98,13,0,0,32                                         FI
·330 DATA 170,13,32,226,85,76,180,13,32,170,13
,32,50,142,76,180,13,32                                          OF
·340 DATA 170,13,32,210,255,76,180,13,32,170,1
3,32,228,255,76,180,13,32                                        AK
·350 DATA 170,13,32,186,255,76,180,13,32,170,1
3,32,189,255                                                     BP
·360 DATA 76,180,13,32,170,13,32,192,255,76,18
0,13,32,170,13                                                   FP
·370 DATA 32,201,255,76,180,13,32,170,13,32,20
4,255,76,180,13,32,170                                           ID
·380 DATA 13,32,195,255,76,180,13,133,67,169,0
,141,0,255,165,67,96                                             BJ
·390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
,0                                                               IF
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previous saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program.

f7 temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
]"
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"
·120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.
[3" "]"
·125 FORA=54272TO54296:POKEA,0:NEXT
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
KE54296,15
·135 FORA=680TO699:READB:POKEA,B:NEXT
·140 DATA169,251,166,253,164,254,32,216,255,96
·145 DATA169,0,166,251,164,252,32,213,255,96
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B
·155 GOSUB480:IFB=0THEN150
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B
·170 GOSUB470:IFB=0THEN150
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1
·185 POKE253,B:PRINT
·190 REM  GET HEX LINE
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8
·200 FORB=0TO1:GOTO250
·205 NEXTB
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340
·215 PRINT" [c P][LEFT]";
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255
·230 NEXT
·235 IFA%(8)<>TTHENGOSUB375:GOTO195
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195
·245 REM    GET HEX INPUT
·250 GETA$:IFA$=""THEN250
·255 IFA$=CHR$(20)THEN305
·260 IFA$=CHR$(133)THEN535
·265 IFA$=CHR$(134)THEN560
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295
·290 GOSUB415:GOTO250
·295 PRINTA$"[c P][LEFT]";
·300 GOTO205
·305 IFA>0THEN320
·310 A=-1:IFB=1THEN330
·315 GOTO220
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1
·325 A=A-1
·330 PRINTCHR$(20);:GOTO220
·335 REM LAST LINE
·340 PRINT" ":T=AD-(INT(AD/256)*256)
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255
·350 NEXT
·355 IFA%(A)<>TTHENGOSUB375:GOTO195
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535
·370 REM BELL AND ERROR MESSAGES
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
GOTO415
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415
·400 PRINT"?ERROR IN SAVE":GOTO415
·405 PRINT"?ERROR IN LOAD":GOTO415
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT
·415 POKE54276,17:POKE54276,16:RETURN
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN
·425 REM GET FOUR DIGIT HEX
·430 PRINT:PRINTB$;:INPUTT$
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
380:GOTO430
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN
·460 T(A)=16:RETURN
·465 REM ADRESS CHECK
·470 IFAD>ENTHEN385
·475 IFB<SRORB>ENTHEN390
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395
·485 RETURN
·490 REM ADDRESS TO HEX
·495 AC=AD:A=4096:GOSUB520
·500 A=256:GOSUB520
·505 A=16:GOSUB520
·510 A=1:GOSUB520
·515 RETURN
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530
·525 A$=CHR$(T+48)
·530 PRINTA$;:AC=AC-A*T:RETURN
·535 A$="**SAVE**":GOSUB585
·540 OPEN1,T,1,A$:SYS680:CLOSE1
·545 IFST=0THENEND
·550 GOSUB400:IFT=8THENGOSUB420
·555 GOTO535
·560 A$="**LOAD**":GOSUB585
·565 OPEN1,T,0,A$:SYS690:CLOSE1
·570 IFST=64THEN195
·575 GOSUB405:IFT=8THENGOSUB420
·580 GOTO560
·585 PRINT" ":PRINTTAB(14)A$
·590 PRINT:A$="":INPUT"FILENAME";A$
·595 IFA$=""THEN590
·600 PRINT:PRINT"TAPE OR DISK?":PRINT
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN
·610 IFB$<>"T"THEN605
·615 RETURN
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B
·625 GOSUB475:IFB=0THEN620
·630 PRINT:GOTO195
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B
·640 GOSUB475:IFB=0THEN635
·645 PRINT:GOTO670
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
OSUB410:GOTO195
·655 PRINT" ";:NEXTB
·660 PRINT:AD=AD+8
·665 GETB$:IFB$=CHR$(136)THEN195
·670 GOSUB495:PRINT": ";:GOTO650
```

THE FASTEST DRAW IN THE INDUSTRY
FROM PAGE 27

Assembler required for program entry! See introductory article.

RECTANGLE.S

```
 1 *
 2 * RECTANGLE.S
 3 *
 4           ORG   $1300
 5 *
 6 TEMPA     EQU   $FA
 7 TEMPB     EQU   TEMPA+2
 8 *
 9 TABPTR    EQU   TEMPA
10 *
11 COLOR     EQU   $10
12 BMFLG     EQU   $D8
13 BMPTR     EQU   $A2D
14 COLMAP    EQU   $1C00
15 SCROLY    EQU   $D011
16 *
17 HMAX      EQU   320
18 *
19 SCRBAS    EQU   $2000
20 PTRL      EQU   $8000
21 PTRH      EQU   $8100
22 *
23 MAPLEN    EQU   1000
24 SCRLEN    EQU   8000
25 *
26 HSTART    EQU   $0C00
27 HEND      EQU   $0C02
28 VSTART    EQU   $0C04
29 VEND      EQU   $0C05
30 *
31 TABSIZ    EQU   VEND+1
32 HPSN      EQU   TABSIZ+2
33 VPSN      EQU   HPSN+2
34 CHAR      EQU   VPSN+1
35 ROW       EQU   CHAR+1
36 LINE      EQU   ROW+1
37 BYTE      EQU   LINE+1
38 BITT      EQU   BYTE+2
39 *
40 MPRL      EQU   BITT+1
41 MPRH      EQU   MPRL+1
42 MPDL      EQU   MPRH+1
43 MPDH      EQU   MPDL+1
44 PRODL     EQU   MPDH+1
45 PRODH     EQU   PRODL+1
46 *
47 FILVAL    EQU   PRODH+1
48 HPOS      EQU   FILVAL+1
49 *
50           JMP   START
51 *
52 BITPSN    HEX   80,40,20,10
53           HEX   08,04,02,01
54 * BLOCK FILL ROUTINE
55 *
56 BLKFIL    LDA   FILVAL
57           LDX   TABSIZ+1
58           BEQ   PARTPG
59           LDY   #0
60 FULLPG    STA   (TABPTR),Y
61           INY
62           BNE   FULLPG
63           INC   TABPTR+1
64           DEX
65           BNE   FULLPG
66 PARTPG    LDX   TABSIZ
67           BEQ   FINI
68           LDY   #0
69 PARTLP    STA   (TABPTR),Y
70           INY
71           DEX
72           BNE   PARTLP
73 FINI      RTS
74 *
75 * 16-BIT MULTIPLICATION
76 *
77 MULT16    LDA   #0
78           STA   PRODL
79           STA   PRODH
80           LDX   #16
81 SHIFT     ASL   PRODL
82           ROL   PRODH
83           ASL   MPRL
84           ROL   MPRH
85           BCC   NOADD
86           CLC
87           LDA   MPDL
88           ADC   PRODL
89           STA   PRODL
90           LDA   MPDH
91           ADC   PRODH
92           STA   PRODH
93 NOADD     DEX
94           BNE   SHIFT
95           RTS
96 *
97 * CREATE Y-LOOKUP TABLE
98 *
99 MAKTAB    LDY   #0
100 YLOOP    CPY   #200
101          BCC   CONT
102          JMP   EXIT
103 *
104 * DIVIDE Y BY 8
105 *
106 CONT     TYA
107          LSR   A
108          LSR   A
109          LSR   A
110          STA   ROW
111 *
112 * MULTIPLY ROW * HMAX
113 *
114          LDA   ROW
115          STA   MPRL
116          LDA   #0
117          STA   MPRH
118          LDA   #<HMAX
119          STA   MPDL
120          LDA   #>HMAX
121          STA   MPDH
122          JSR   MULT16
123          LDA   PRODL
124          STA   TEMPA
125          LDA   PRODH
126          STA   TEMPA+1
127 *
128 * ADD PRODUCT TO SCRBAS
129 *
130          CLC
131          LDA   #<SCRBAS
132          ADC   TEMPA
133          STA   PTRL,Y
134          LDA   #>SCRBAS
135          ADC   TEMPA+1
136          STA   PTRH,Y
137 *
138          INY
139          JMP   YLOOP
140 *
141 EXIT      RTS
142 *
143 * MAIN ROUTINE
144 *
145 * DEFINE BIT MAP AND
146 * ENABLE HI-RES GRAPHICS
147 *
148 START     JSR   MAKTAB
149 *
150          STA   $FF01
151          LDA   #$78
152          STA   BMPTR
153 *
154          LDA   #$20
155          STA   BMFLG
156 *
157          LDA   #0
158          STA   $FF00
159          LDA   SCROLY
160          ORA   #$20
161          STA   SCROLY
162          STA   $FF01
163 *
164 * CLEAR BIT MAP
165 *
166          LDA   #0
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
167             STA   FILVAL
168             LDA   #<SCRBAS
169             STA   TABPTR
170             LDA   #>SCRBAS
171             STA   TABPTR+1
172             LDA   #<SCRLEN
173             STA   TABSIZ
174             LDA   #>SCRLEN
175             STA   TABSIZ+1
176             JSR   BLKFIL
177 *
178 * SET BKG AND LINE COLORS
179 *
180             LDA   #COLOR
181             STA   FILVAL
182             LDA   #<COLMAP
183             STA   TABPTR
184             LDA   #>COLMAP
185             STA   TABPTR+1
186             LDA   #<MAPLEN
187             STA   TABSIZ
188             LDA   #>MAPLEN
189             STA   TABSIZ+1
190             JSR   BLKFIL
191 *
192 * DRAW HORIZONTAL LINES
193 *
194             LDA   VSTART
195             STA   VPSN
196             LDA   HSTART
197             STA   HPSN
198             LDA   HSTART+1
199             STA   HPSN+1
200             JSR   HDRAW
201 *
202             LDA   VEND
203             STA   VPSN
204             LDA   HSTART
205             STA   HPSN
206             LDA   HSTART+1
207             STA   HPSN+1
208             JSR   HDRAW
209 *
210 * DRAW VERTICAL LINES
211 *
212             LDA   VSTART
213             STA   VPSN
214             LDA   HSTART
215             STA   HPOS
216             LDA   HSTART+1
217             STA   HPOS+1
218             JSR   VDRAW
219 *
220             LDA   VSTART
221             STA   VPSN
222             LDA   HEND
223             STA   HPOS
224             LDA   HEND+1
225             STA   HPOS+1
226             JSR   VDRAW
227 *
228 INF         JMP   INF
229 *
230 HDRAW        JSR   PLOT
231             INC   HPSN
232             BNE   NEXT
233             INC   HPSN+1
234 NEXT        LDA   HPSN+1
235             CMP   HEND+1
236             BCC   HDRAW
237             LDA   HPSN
238             CMP   HEND
239             BCC   HDRAW
240             RTS
241 *
242 VDRAW        LDA   HPOS
243             STA   HPSN
244             LDA   HPOS+1
245             STA   HPSN+1
246             JSR   PLOT
247             INC   HPSN
248             BNE   SKIP
249             INC   HPSN+1
250 SKIP        JSR   PLOT
251             LDX   VPSN
252             INX
253             STX   VPSN
254             CPX   VEND
255             BCC   VDRAW
256             RTS
257 *
258 * CHAR=HPSN/8
259 *
260 PLOT        LDA   HPSN
261             LSR   HPSN+1
262             ROR
263             LSR   HPSN+1
264             ROR
265             LSR   HPSN+1
266             ROR
267             STA   CHAR
268 *
269 * MULTIPLY 8 * CHAR
270 *
271             LDA   #0
272             ASL   CHAR
273             ROL
274             ASL   CHAR
275             ROL
276             ASL   CHAR
277             ROL
278             STA   TEMPB+1
279 *
280 * ADD LINE
281 *
282             CLC
283             LDA   VPSN
284             AND   #7
285             ADC   CHAR
286             STA   TEMPB
287             LDA   TEMPB+1
288             ADC   #0
289             STA   TEMPB+1
290 *
291 * BYTE = TEMPA + TEMPB
292 *
293             CLC
294             LDY   VPSN
295             LDA   PTRL,Y
296             ADC   TEMPB
297             STA   TEMPB
298             LDA   PTRH,Y
299             ADC   TEMPB+1
300             STA   TEMPB+1
301 *
302 * BYTE=BYTE OR 2^BIT
303 *
304             LDA   HPSN
305             AND   #$07
306             TAX
307             LDY   #0
308             LDA   (TEMPB),Y
309             ORA   BITPSN,X
310             STA   (TEMPB),Y
311             RTS
312 *
```

RECTANGLE.BAS

```
·10 REM *** RECTANGLE.BAS ***                    DI
·20 :                                            BO
·30 HST = 105                                    KM
·40 HND = 211
·50 VST = 66                                     DO
·60 VND = 132                                    KK
·70 :
·80 IF A=0 THEN A=1:BLOAD "RECTANGLE.O"
·90 HI=INT(HST/256):LO=HST-HI*256
·100 POKE DEC("0C00"),LO:POKE DEC("0C01")
  ,HI
·110 HI=INT(HND/256):LO=HND-HI*256
·120 POKE DEC("0C02"),LO:POKE DEC("0C03")
```

```
 ,HI                                                    OC
·130 POKE DEC("0C04"),VST:POKE DEC("0C05"
 ),VND                                                  NO
·140 SYS DEC("1300")                                    NG
```

ANALOG TO DIGITAL ADVENTURES

FROM PAGE 20

DIGITAL SCOPE

```
·1 REM                                                  JD
·2 REM       -- DIGITAL SCOPE --                        OL
·3 REM      PROGRAM FOR THE C-128                       IJ
·4 REM        RUPERT REPORT #34                         OK
·5 REM                                                  JD
·6 REM  *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*       CD
·7 REM   USE A/D CONVERTER TO CREATE                    CI
·8 REM     A DIGITAL OSCILLOSCOPE                       GN
·9 REM  KEYS:                                           BJ
·10 REM  <CRSR UP> - SHIFT DISPLAY UP                   JB
·11 REM  <CRSR DN> - SHIFT DISPLAY DOWN                 OA
·12 REM  "+" - MAGNIFY DISPLAY                          HH
·13 REM  "-" - DEMAGNIFY DISPLAY                        NH
·14 REM  "C" - CLEAR DISPLAY                            LK
·15 REM  "P" - PAUSE DISPLAY                            PK
·16 REM        (ANY KEY TO RESTART)                     GN
·17 REM  "Z" - REINITIALIZE PARAMETERS                  CI
·18 REM *-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*-*       CD
·19 REM                                                 JD
·20 TRAP 1000                                           JM
·25 REM >=>=>=>=>=>=> DEFINE CONSTANTS >=>              CJ
·30 D$="V" : U$="[UPARROW]"                             NL
·40 MAX=10      :REM  RUNNING AVERAGE QTY.              EC
·50 PN=1        :REM  POT NUMBER                        AD
·60 REM >=>=>=>=>=>=>  INITIALIZATION >=>               KB
·70 GRAPHIC 1,1                                         GP
·80 G=190/255 :REM  GAIN (MAGNIFICATION)                FM
·90 VY=5        :REM  VERTICAL OFFSET                   FJ
·100 PRINT POT(PN)*G+VY,    :REM  INITIAL
  Y SCREEN VALUE                                        LI
·110 REM >=>=>=>=>=>=>=>=>=> MAIN LOOP >=>              ID
·120 FOR X=1 TO 320                                     PC
·130 Y=200-(POT(PN)*G+VY)                               JO
·140 DRAW ,X,Y                                          PE
·150 REM >=>=>=>=>=>=> RUNNING AVERAGE >=>              FL
·160 PTR=PTR+1 : IF PTR>MAX THEN PTR=0                  OB
·170 SUM=SUM-YV(PTR)+Y                                  CE
·180 YV(PTR)=Y        :REM  REPLACE OLDEST
  Y VALUE WITH NEWEST                                   MO
·190 AVG=SUM/MAX      :REM  CALC. AVERAGE               CB
·200 DRAW ,X,AVG-50   :REM  PLOT IT                     GI
·210 REM -=-=- LOCATE OFFSCREEN IMAGE -=-               PD
·220 IF Y<200 AND Y>0 THEN CHAR ,1,24," "
  : CHAR ,1,0," " : GOTO 240                            AH
·230 IF Y>200 THEN CHAR ,1,24,D$ :ELSE IF
  Y<0 THEN CHAR ,1,0,U$                                 DN
·240 GET A$ : IF A$>"" THEN 290                         JN
·250 NEXT X                                             NK
·260 GRAPHIC 1,1      :REM  CLEAR SCREEN                DE
·270 GOTO 120         :REM  START AGAIN                 OA
·280 REM >=>=>=>=>=>=>=>=> KEY PRESSED >=>              MI
·290 K=INSTR("[UP][DOWN]+-CPZ",A$)                      AL
·300 IF K=0 THEN 250   :REM INVALID KEY                 NI
·310 ON K GOSUB 330,340,350,360,370,380,3
 90                                                     KE
·320 ON K GOTO 250,250,250,250,120,250,70               CA
·330 VY=VY+5 : RETURN  :REM CURSOR UP                   NM
·340 VY=VY-5 : RETURN  :REM CURSOR DOWN                 KD
·350 G=G*1.1 : RETURN  :REM  +(GAIN UP)                 BI
·360 G=G*.9 : RETURN   :REM -(GAIN DOWN)                AF
·370 GRAPHIC 1,1 :RETURN :REM C (CLEAR)                 MP
·380 GETKEY Q$ : RETURN  :REM P (PAUSE)                 PG
·390 RETURN       :REM  Z (ZERO/RESTART)                HI
·1000 IF ER=30 THEN END  :REM RUN/STOP                  JD
·1010 RESUME NEXT                                       FI
```

ATTACK FORCE

FROM PAGE 72

```
·10 POKE52,55:POKE56,55:CLR:GOTO800                     OO
·20 POKE00,1:POKEPS,0:POKEHT,0:POKETH,0:F
 C=0:TC=10:LC=18:CC=12:Y=25                             KJ
·30 GOTO100                                             CF
·50 GOSUB660                                            CI
·55 PRINT"[HOME][YELLOW] AGAIN[3"."]":SYS
 SR:SYSSR                                               HM
·60 PRINT"[HOME] YOUR PEOPLE ARE FREE ONC
 E":SYSSR:SYSSR:SYSSR:SYSSR                             KD
·65 PRINT"[HOME][RED] OF THE ENEMY INSTAL
 LATIONS.":SYSSR:SYSSR                                  DH
·70 PRINT"[HOME] YOU HAVE DESTROYED ALL":
 SYSSR:SYSSR                                            BF
·75 FORI=1TO6:SYSSR:NEXT:POKES+5,128:POKE
 S+6,248:POKES+12,0:POKES+13,240                        MC
·80 P(0)=34:P(1)=34:P(2)=45:D(0)=200:D(1)
 =100:D(2)=450                                          OB
·85 FORI=0TO2:POKES+1,P(I):POKES+8,P(I)-1
 5:POKES,0:POKES+7,0                                    JH
·86 POKES+4,17:POKES+11,17                              CP
·90 FORD=1TOD(I):NEXT:POKES+4,16:POKES+11
 ,16:FORJ=1TO25:NEXT:NEXT                               CK
·95 SYSXY,7,23:PRINT"[BLUE]PRESS ANY KEY"
 :POKE198,0                                             FP
·98 GETA$:IFA$=""THEN98                                 GC
·99 MS=9:GOTO700                                        AD
·100 IFPEEK(PS)THEN200                                  IK
·110 IFPEEK(TH)THENGOSUB400                             BF
·115 IFPEEK(HT)THENGOSUB450                             AE
·120 IFINT(RND(1)*30)=1ANDBS=0THENGOSUB46
 0                                                      IL
·130 IFBS=1THENGOSUB470                                 NA
```

```
·140 FC=FC+1:IFFC=40+MS*2THENFC=0:GOTO325 LE
·150 IFPEEK(653)AND1THEN190 GF
·180 GOSUB300 CD
·185 GOTO100 CF
·190 IFPEEK(653)THENPOKE00,0:POKES+24,0:G
OTO190 LN
·195 POKE00,1:POKES+24,47:GOTO180 ME
·200 POKE2040,253:POKES+1,8:POKES+5,0:POK
ES+6,13:POKES+4,129:POKES+4,128 FO
·205 POKES+11,0:POKES+18,0 BM
·210 POKEV+28,PEEK(V+28)OR1:FORI=1TO100:P
OKEV+39,8:POKEV+39,2:NEXT MB
·215 BS=0:SYSXY,32,21:PRINT"[5" "]" NJ
·220 FORI=1TO1500:NEXT:SH=SH-1:IFSH=-1THE
N250 NB
·225 SYSXY,31,14:PRINT"[BLUE]"SH:POKEV+21
,192:FC=0:GOTO500 EG
·250 POKE00,0:POKES+4,0:POKES+11,0:POKES+
18,0:POKEV+21,192 PK
·255 SYSXY,7,10:PRINT"[YELLOW]][11"[UPARR
OW]"]?" KE
·260 PRINTTAB(7)"[ [WHITE]GAME OVER[YELLO
W] @" PK
·265 PRINTTAB(7)"[EP][11"[UPARROW]"][BACK
ARROW]" KO
·270 FORI=1TO3000:NEXT:POKEV+21,0:GOTO700 OJ
·300 SYSSR:Y=Y+1:IFY=35-MSTHENY=0:GOSUB34
0 BA
·305 TC=TC+1:IFTC=35-MSTHENTC=0:GOSUB350 AI
·310 CC=CC+1:IFCC=35-MSTHENCC=0:GOSUB380 JJ
·315 LC=LC+1:IFLC=35-MSTHENLC=0:GOSUB390 CE
·320 RETURN IM
·325 F=F-1:IFF=0THEN200 EE
·330 SYSXY,30,17:PRINT"[9" "]" JE
·335 SYSXY,30,17:PRINTLEFT$(F$,F*2):GOTO1
80 CO
·340 SYSXY,0,0:POKE646,RND(1)*6+10:PRINTW
L$(RND(1)*9+1):RETURN BJ
·350 POKEV+6,RND(1)*220+30:POKEV+7,28:POK
EV+21,PEEK(V+21)OR8:POKETH,0 JK
·352 POKE2043,251:POKEV+42,11:RETURN MI
·380 POKEV+4,RND(1)*220+30:POKEV+5,28:POK
EV+21,PEEK(V+21)OR4:POKEHT,0 KC
·385 POKE2042,252:POKEV+41,8:RETURN HF
·390 SYSXY,0,0:PRINTLZ$(RND(1)*8+1):RETUR
N CK
·400 IFPEEK(2043)=253THENRETURN AM
·405 POKEV+42,2:POKE2043,253 AH
·410 SC=SC+250:GOSUB680 IA
·415 T=T+1:IFT=MS+4THEN570 OH
·420 RETURN IM
·450 IFPEEK(2042)=253THENRETURN PF
·455 POKEV+41,2:POKE2042,253 BB
·458 SC=SC+10+10*MS:GOSUB680:RETURN HJ
·460 BS=1:BF=150:POKES+12,0:POKES+13,240:
POKES+8,BF HD
·465 X=INT(RND(1)*26)+1:XX=INT(X/6)+1 KI
·466 SYSXY,XX+31,21:PRINT"[RED].":POKES+1
1,17 MB
·468 RETURN IM
·470 BF=BF-5:POKES+8,BF:IFBF>90THENRETURN CN
·475 Z=INT(PEEK(V+1)/8):SYSXY,X,Z-7:PRINT
"[RED][3"&"][UP][LEFT][LEFT]&[DOWN][DOWN
][LEFT]&":POKES+11,16:BS=0 MK
·480 SYSXY,32,21:PRINT"[5" "]" BJ
·485 POKES+11,16:POKES+8,8:POKES+12,0:POK
ES+13,11:POKES+11,129:POKES+11,128 FE
·490 RETURN IM
·500 POKEV+21,192:GOSUB660:POKE2040,255:P
OKE2041,254:POKE2042,252:POKE2043,251 FJ
·505 POKE V,124:POKEV+1,210:POKEV+39,6:PO
KEV+40,2:SYSXY,31,11:PRINT"[BLUE]"MS BO
·510 POKEV+41,8:POKEV+42,11:POKEV+28,12:P
OKEV+37,7:POKEV+38,12 LK
·515 POKE53270,PEEK(53270)OR16:POKE53282,
1 BC
·520 POKEV+23,0:POKEV+29,0:POKEV+21,193 DH
·522 POKES+23,244:POKES+22,0:POKES+24,47:
POKES+19,208:POKES+20,240 EO
·524 POKES+14,0:POKES+15,6:POKES+18,129 DE
·525 SYSXY,3,11:PRINT"[RED]PREPARE FOR MI
SSION"MS CE
·528 SYSXY,5,13:PRINT"DESTROY"MS+4-T"TOWE
R";:IFMS+4-T>1THENPRINT"S" GE
·530 POKES+5,0:POKES+6,240:POKES+4,33:FOR
I=1TO3 FJ
·535 POKES+1,8:POKES,97:FORJ=1TO350:NEXT:
POKES+1,12:POKES,32:FORJ=1TO350:NEXT GL
·540 NEXT:POKES+4,32 AL
·545 GOSUB660:TC=0:Y=0 GB
·550 OO=53245:SS=52992:TS=52993:PS=52994:
HT=52995:TH=52996:SR=50432 AF
·555 POKES+5,0:POKES+6,9 IK
·560 F$="[RED]'[GREEN]'[GREEN]'[GREEN]'[G
REEN]'[GREEN]'[GREEN]'[GREEN]'[GREEN]'":
SYSXY,30,17:PRINTF$:F=9 CG
·565 Z=PEEK(V+30):Z=PEEK(V+31):GOTO20 FB
·570 POKEV+21,192:POKES+4,0:POKES+11,0:PO
KES+18,0:GOSUB660 PA
·575 SYSXY,4,11:PRINT"[WHITE]MISSION"MS"C
OMPLETED":POKE00,0 KB
·580 FORI=1TO500:NEXT:MS=MS+1:IFMS=10THEN
50 EC
·585 SYSXY,7,13:PRINT"[YELLOW]BONUS:"F*10
"PTS.":GOSUB680 MH
·590 FORI=1TO2500:NEXT:T=0:GOTO500 CL
·600 FORI=1093TO1973STEP40:POKEI,27:POKEI
+10,0:NEXT NN
·610 XY=832:SYSXY,29,0:PRINT"[WHITE]][9"[
UPARROW]"]?" EG
·615 SYSXY,29,24:PRINT"[EP][9"[UPARROW]"]
";:POKE2023,31 EA
·620 FORI=3TO18STEP3:SYSXY,30,I:PRINT"[9"
[UPARROW]"]":NEXT EI
·625 SYSXY,31,4:PRINT"[CYAN]SCORE":SYSXY,
31,7:PRINT"HIGH":SYSXY,31,10:PRINT"MISSI
```

```
ON"                                                    KE
·630 SYSXY,31,13:PRINT"SHIPS":SYSXY,31,16
:PRINT"FUEL"                                           KB
·632 PRINTTAB(30)"[RED]'[GREEN][8"'"][CYA
N]"                                                    BB
·635 SYSXY,31,19:PRINT"SCANNER":PRINTTAB(
31)"[BLUE]][5"[UPARROW]"]?"                            FE
·640 PRINTTAB(31)"[[5" "]@":PRINTTAB(31)"
[  [BLUE]*[BLUE]  @"                                   BA
·650 PRINTTAB(31)"[EP][5"[UPARROW]"][BACK
ARROW]"                                                LG
·655 RETURN                                            IM
·660 FORI=0TO12:SYSXY,0,I:PRINT"[29" "]"               CA
·670 SYSXY,0,24-I:PRINT"[29" "]";:NEXT:RE
TURN                                                   FF
·680 SYSXY,31,5:PRINT"[BLUE][8" "]":SYSXY
,31,5:PRINTSC                                          BI
·685 IFSC>HSTHENHS=SC:SYSXY,31,8:PRINT"[8
" "]":SYSXY,31,8:PRINTHS                               MO
·690 RETURN                                            IM
·700 POKE53281,0:POKE53280,11:POKEV+28,0:
POKE53270,PEEK(53270)AND239                            LD
·705 POKEV+23,1:POKEV+29,1:POKEV+16,192:P
OKEV+12,25:POKEV+14,49                                 EL
·710 POKEV+13,57:POKEV+15,57:POKE2046,249
:POKE2047,250                                          BF
·712 POKEV,122:POKEV+1,85:POKEV+39,6:POKE
2040,255                                               BK
·715 POKEV+45,7:POKEV+46,7:POKEV+21,193:P
RINT"[WHITE][CLEAR]":GOSUB600                          JO
·716 SYSXY,31,5:PRINT"[BLUE]"SC:SYSXY,31,
8:PRINTHS:SYSXY,31,11:PRINTMS                          JA
·718 SH=3:SYSXY,31,14:PRINTSH                          ME
·720 SYSXY,2,15:PRINT"[RED]PRESS [WHITE]F
1[RED] TO SELECT MISSION"                              LL
·725 SYSXY,4,17:PRINT"[c 1]PRESS [WHITE]F
3[c 1] TO START GAME"                                  LP
·730 SYSXY,7,19:PRINT"[c 3]PRESS [WHITE]F
7[c 3] TO EXIT"                                        KK
·740 GETA$:IFA$=""THEN740                              JO
·750 IFA$="[F1]"THENMS=MS+1:IFMS=10THENMS
=1                                                     JA
·755 SYSXY,31,11:PRINT"[BLUE]"MS                       ED
·760 IFA$="[F3]"THEN780                                ML
·770 IFA$="[F7]"THENPOKEV+21,0:PRINT"[WHI
TE][CLEAR]":END                                        OM
·775 GOTO740                                           CH
·780 SC=0:F=9:T=0:GOSUB680:GOTO500                     EG
·800 POKE53281,11:POKE53280,11:POKE646,7:
V=53248:S=54272:PRINT"[CLEAR]":POKEV+21,
0                                                      OL
·805 FORI=STOS+23:POKEI,0:NEXT:POKES+24,1
5                                                      JL
·806 POKES+5,0:POKES+6,14:POKES+1,150                  DE
·808 POKE53270,PEEK(53270)AND239:POKEV+28
,0                                                     AN
·810 FORI=249TO255:FORJ=0TO63:READK:POKE6
4*I+J,K:NEXT:NEXT                                      BD
·815 POKE2040,249:POKE2041,250:POKEV+29,3
:POKEV+23,3                                            NE
·820 POKEV+39,0:POKEV+40,0:POKES+4,129:PO
KES+4,128                                              IB
·825 POKEV,136:POKEV+2,184:POKEV+1,110:PO
KEV+3,110:POKEV+21,3                                   MK
·828 FORI=0TO240:POKES+1,I:POKEV+39,I:POK
EV+40,I:NEXT                                           CI
·830 PRINT"[17"[DOWN]"][YELLOW]"SPC(7)"PL
UG JOYSTICK INTO PORT 2"                               BL
·835 PRINT"[DOWN][DOWN]"SPC(13)"[c 7]LOAD
ING DATA"                                              EC
·845 POKE56334,PEEK(56334)AND254:POKE1,PE
EK(1)AND251                                            BE
·850 FORI=0TO511:POKEI+14336,PEEK(I+53248
):NEXT                                                 GC
·855 POKE1,PEEK(1)OR4:POKE56334,PEEK(5633
4)OR1                                                  IE
·860 POKE53272,(PEEK(53272)AND240)+14                  LK
·865 READK:IFK=-1THEN875                               KI
·870 FORI=0TO7:READJ:POKE14336+K*8+I,J:NE
XT:GOTO865                                             DD
·875 FORI=832TO860:READJ:POKEI,J:NEXT                  FD
·878 FORI=1TO9:READWL$(I):NEXT:FORI=1TO8:
READLZ$(I):NEXT                                        PM
·880 FORI=49152TO49577:READJ:POKEI,J:NEXT              MJ
·885 FORI=50432TO50633:READJ:POKEI,J:NEXT              IB
·890 MS=1:SH=3:POKE53245,0:SYS49553:GOTO7
00                                                     KN
·900 DATA1,223,124,1,68,17,2,68                        MC
·901 DATA17,3,196,17,4,68,17,4                         FG
·902 DATA68,17,8,68,17,8,0,0                           IC
·903 DATA16,0,0,31,156,56,32,34                        ME
·904 DATA68,60,34,68,64,66,121,64                      BA
·905 DATA68,145,128,68,144,128,56,136                  BF
·906 DATA0,0,0,0,0,0,0,0                               FG
·907 DATA0,0,0,0,0,0,0,0                               FG
·908 DATA227,145,0,20,82,0,20,20                       FD
·909 DATA0,244,24,0,20,20,0,20                         CN
·910 DATA82,0,19,145,0,0,0,0                           KI
·911 DATA0,0,0,112,240,0,137,0                         KA
·912 DATA0,129,0,0,3,192,0,2                           GH
·913 DATA0,0,148,0,0,103,192,0                         GE
·914 DATA0,0,0,0,0,0,0,0                               FG
·915 DATA0,0,0,0,0,0,0,2                               FI
·916 DATA10,160,0,42,168,0,234,171                     KM
·917 DATA0,186,175,0,171,255,0,170                     DA
·918 DATA255,0,170,255,0,170,255,0                     IJ
·919 DATA170,255,0,170,255,0,170,255                   IA
·920 DATA0,170,255,0,170,255,0,170                     DH
·921 DATA255,0,170,255,0,170,255,0                     IJ
·922 DATA170,255,0,170,255,0,42,252                    GP
·923 DATA0,10,240,0,0,0,0,0                            MJ
·924 DATA0,0,0,0,0,0,0,0                               FG
·925 DATA0,0,0,0,0,0,0,0                               FG
·926 DATA0,0,0,168,0,10,170,128                        PF
·927 DATA42,170,160,86,170,84,169,85                   CC
·928 DATA168,42,170,160,10,170,128,0                   BK
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·929 DATA168,0,0,0,0,0,0,0                                    AE
·930 DATA0,0,0,0,0,0,0,0                                      FG
·931 DATA0,0,0,0,0,0,0,18                                     IC
·932 DATA0,0,0,2,10,0,0,0                                     IG
·933 DATA0,2,8,8,32,34,0,0                                    OL
·934 DATA138,128,10,10,0,2,168,162                            HK
·935 DATA138,42,162,34,136,128,40,170                         EO
·936 DATA162,10,170,32,34,170,136,10                          MJ
·937 DATA40,168,136,170,32,0,34,136                           IF
·938 DATA2,138,128,32,40,32,8,32                              OO
·939 DATA128,0,2,8,0,32,0,255                                 PN
·940 DATA0,0,0,0,0,0,0,0                                      FG
·941 DATA0,0,0,0,128,0,32,128                                 LE
·942 DATA0,32,128,0,32,128,0,32                               OL
·943 DATA128,0,32,128,0,032,0,0                               AA
·944 DATA0,0,0,0,0,0,0,0                                      FG
·945 DATA0,0,0,0,0,0,0,0                                      FG
·946 DATA0,0,0,0,0,0,0,0                                      FG
·947 DATA0,0,0,0,0,0,0,0                                      FG
·948 DATA0,64,0,0,64,0,0,64                                   CI
·949 DATA0,0,224,0,0,224,0,1                                  NF
·950 DATA176,0,1,16,0,1,16,0                                  DA
·951 DATA1,176,0,1,240,0,1,240                                IG
·952 DATA0,6,236,0,14,238,0,14                                EF
·953 DATA174,0,29,183,0,189,183,160                           DM
·954 DATA253,183,224,253,183,224,7,28                         PI
·955 DATA0,0,0,0,0,0,0,0                                      FG
·956 DATA0,216,216,216,216,216,216,216,21
6                                                             PP
·957 DATA27,27,27,27,27,27,27,27,27                           PF
·958 DATA28,27,27,27,24,15,0,0,0                              PN
·959 DATA29,0,0,15,24,27,27,27,27                             FE
·960 DATA30,0,0,255,0,255,0,0,0                               EL
·961 DATA31,216,216,216,24,240,0,0,0                          HJ
·962 DATA33,0,1,15,15,29,60,124,126                           GK
·963 DATA35,0,128,240,240,184,60,62,126                       EJ
·965 DATA38,8,90,52,191,90,52,74,16                           KI
·966 DATA45,85,85,255,255,255,255,255,255                     EA
·967 DATA44,85,93,245,245,245,245,244,240                     EM
·968 DATA47,21,85,255,255,255,255,255,255                     EM
·969 DATA63,0,0,240,24,216,216,216,216                        EK
·970 DATA39,255,255,255,255,255,255,255,2
55,-1                                                         ED
·971 DATA32,253,174,32,138,173,32,247,183                     BO
·972 DATA152,72,32,253,174,32,138,173,32                      AD
·973 DATA247,183,152,170,104,168,24,32                        KF
·974 DATA240,255,96                                           GL
·980 DATA"--,[3" "]/[22"-"]"                                  FE
·981 DATA"[6"-"],[3" "]/[18"-"]"                              GM
·982 DATA"[10"-"],[3" "]/[14"-"]"                             FE
·983 DATA"[14"-"],[3" "]/[10"-"]"                             DM
·984 DATA"[18"-"],[3" "]/[6"-"]"                              DE
·985 DATA"[22"-"],[3" "]/--"                                  GM
·986 DATA"--,[3" "]/[5"-"],[3" "]/[5"-"],
[3" "][3"-"]"                                                 BC
·987 DATA"[3" "]/[21"-"],[3" "]"                              OG
·988 DATA"--,[3" "]/[15"-"],[3" "]/--"                        IB
·990 DATA"  [WHITE]![RED][11"%"][WHITE]#"                     DG
·991 DATA"  [WHITE]![RED][6"%"][WHITE]#[4
" "]![RED][6"%"][WHITE]#  "                                   KI
·992 DATA"[7" "][WHITE]![RED][13"%"][WHIT
E]#"                                                          NK
·993 DATA"[13" "][WHITE]![RED][12"%"][WHI
TE]#"                                                         IC
·994 DATA"  [WHITE]![RED]%%[WHITE]#[3" "]
![RED]%%[WHITE]#[3" "]![RED]%%[WHITE]#[3
" "]![RED]%%[WHITE]#"                                         CP
·995 DATA"[3" "][WHITE]![RED][21"%"][WHIT
E]#"                                                          IC
·996 DATA"[WHITE]![RED][5"%"][WHITE]#[4"
"]![RED][5"%"][WHITE]#[4" "]![RED][5"%"]
[WHITE]#"                                                     CN
·997 DATA" [WHITE]![RED]%[WHITE]#[3" "]![
RED]%%[WHITE]#[3" "]![RED][3"%"][WHITE]#
[3" "]![RED][4"%"][WHITE]#"                                   MG
·1000 DATA173,253,207,240,37,173,0,220,41
,16,240,5,169,0,141,249,207,173                               NH
·1001 DATA2,207,208,6,32,45,192,32,112,19
2,173,3,207,208,3,32,3,193,32                                 BN
·1002 DATA198,192,32,74,193,108,254,207,1
73,0,220,174,0,208,41,8,240,10                                IM
·1003 DATA224,26,240,23,206,0,208,206,0,2
08,173,0,220,41,4,240,10,224                                  GA
·1004 DATA238,240,6,238,0,208,238,0,208,1
73,0,220,41,1,208,12,174,1,208                                GP
·1005 DATA224,165,144,15,206,1,208,208,10
,174,1,208,224,210,240,3,238,1                                JN
·1006 DATA208,96,173,252,207,240,23,174,3
,208,224,35,144,60,206,3,208,206                              KE
·1007 DATA3,208,206,3,208,173,3,208,141,1
,212,96,173,249,207,208,39,173                                GG
·1008 DATA0,220,41,16,208,32,169,1,141,24
9,207,141,252,207,169,2,13,21                                 KG
·1009 DATA208,141,21,208,173,1,208,141,3,
208,32,64,193,173,0,208,141,2                                 EK
·1010 DATA208,96,169,253,45,21,208,141,21
,208,169,0,141,252,207,96,173,251                             IF
·1011 DATA207,201,7,208,11,162,7,189,243,
192,157,39,57,202,208,247,173                                 LC
·1012 DATA251,207,201,12,208,16,169,0,141
,251,207,162,7,189,251,192,157                                EF
·1013 DATA39,57,202,208,247,238,251,207,9
6,0,12,63,243,192,0,0,0,0,192                                 GC
·1014 DATA243,63,12,0,0,0,173,21,208,41,4
,201,4,240,1,96,173,250,207,240                               NO
·1015 DATA23,173,4,208,201,231,176,10,238
,4,208,238,4,208,238,4,208,96                                 FL
·1016 DATA169,0,141,250,207,96,173,4,208,
201,27,144,10,206,4,208,206,4                                 CJ
·1017 DATA208,206,4,208,96,169,1,141,250,
207,96,162,129,142,4,212,202,142                              EN
·1018 DATA4,212,96,173,30,208,141,16,207,
41,1,240,3,141,2,207,173,16                                   HM
·1019 DATA207,41,6,201,6,208,8,169,1,141,
3,207,32,184,192,173,16,207,41                                GB
·1020 DATA10,201,10,208,8,169,1,141,4,207
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,32,184,192,173,31,208,141,17                    LJ
•1021 DATA207,41,1,240,3,141,2,207,173,17
,207,41,2,240,3,32,184,192,96                    MH
•1022 DATA173,20,3,141,254,207,173,21,3,1
41,255,207,120,169,0,141,20,3                    MH
•1023 DATA169,192,141,21,3,88,96                 PN
•1040 DATA169,152,133,252,169,7,133,253,1
69,152,133,254,169,219,133,255,162               FB
•1041 DATA23,160,28,177,252,141,0,207,177
,254,141,1,207,24,165,252,105                    EJ
•1042 DATA40,133,252,165,253,105,0,133,25
3,165,254,105,40,133,254,165,255                 NM
•1043 DATA105,0,133,255,173,0,207,145,252
,173,1,207,145,254,56,165,252                    AB
•1044 DATA233,40,133,252,165,253,233,0,13
3,253,165,254,233,40,133,254,165                 CM
•1045 DATA255,233,0,133,255,136,192,255,2
08,181,160,28,202,224,255,240,28                 MI
•1046 DATA56,165,252,233,40,133,252,165,2
53,233,0,133,253,165,254,233,40                  IC
•1047 DATA133,254,165,255,233,0,133,255,7
6,20,197,160,28,169,32,145,252                   OH
•1048 DATA169,0,145,254,136,192,255,208,2
43,173,21,208,41,4,240,21,24,173                 BH
•1049 DATA5,208,105,8,141,5,208,201,240,1
44,8,173,21,208,41,251,141,21                    NP
•1050 DATA208,173,21,208,41,8,240,21,24,1
73,7,208,105,8,141,7,208,201                     LM
•1051 DATA240,144,8,173,21,208,41,247,141
,21,208,96                                       JO
```

PENGUINS
FROM PAGE 16

Starting address in hex: C000
Ending address in hex: CB72
SYS to start: 49152
***Flankspeed* required for entry! See page 103.**

```
C000: 20 76 C8 20 4D C2 AD 1F 5C
C008: D0 D0 FB AD 1E D0 D0 FB 0F
C010: AD 11 D0 10 FB AE 1F D0 4A
C018: AC 1E D0 AD 00 DC C9 7F 87
C020: D0 03 AD B5 02 8D B5 02 9E
C028: C9 7B D0 3F AD 10 D0 29 35
C030: 01 D0 0A AD 00 D0 C9 16 6A
C038: D0 03 4C 80 C0 AD 00 D0 18
C040: 38 E9 01 8D 00 D0 B0 76 E8
C048: AD 10 D0 49 01 8D 10 D0 8F
C050: AD AB 02 29 FE 8D AB 02 0F
C058: AD AC 02 29 FE 8D AC 02 19
C060: AD AD 02 29 FE 8D AD 02 23
C068: 4C BE C0 C9 77 D0 37 AD 2B
C070: 10 D0 29 01 F0 0A AD 00 24
C078: D0 C9 41 D0 03 4C 3D C0 72
C080: AD 00 D0 18 69 01 8D 00 0F
C088: D0 90 33 AD AB 02 09 01 82
C090: 8D AB 02 AD AC 02 09 01 32
C098: 8D AC 02 AD AD 02 09 01 3C
C0A0: 8D AD 02 4C BE C0 C9 7E F1
C0A8: D0 06 CE 01 D0 4C BE C0 EB
C0B0: C9 7D D0 0A AD 01 D0 C9 1C
C0B8: DE F0 03 EE 01 D0 8A 29 FF
C0C0: 01 F0 0C A9 F0 18 6D B0 8F
C0C8: 02 8D F8 07 4C DC C0 A9 EB
C0D0: F5 8D F8 07 98 29 54 D0 3B
C0D8: 03 CE 01 D0 98 29 AA F0 D9
C0E0: 5C 20 D6 C4 20 D7 C1 20 D2
C0E8: 04 C2 A0 00 A2 03 18 20 2E
C0F0: F0 FF A9 0F A0 C7 20 1E 41
C0F8: AB 20 DA C2 AD B6 02 D0 99
C100: 39 A9 00 85 FB 85 FC A2 89
C108: 18 A0 0E 18 20 F0 FF A9 A1
C110: 9B A0 C7 20 1E AB A5 C5 69
C118: C9 04 D0 FA A9 03 8D B6 A2
C120: 02 A9 0F 8D B7 02 A9 9F 6B
C128: 20 D2 FF A2 18 A0 00 18 8E
C130: 20 F0 FF A9 64 A0 C7 20 D7
C138: 1E AB 4C 3D C1 A9 FE 85 7B
C140: A2 A5 A2 D0 FC 20 97 E0 91
C148: A5 8D C9 FF D0 03 20 A6 DF
C150: C6 A9 12 20 D2 FF A9 9F 0F
C158: 20 D2 FF A0 22 A2 18 18 E0
C160: 20 F0 FF A5 FC A6 FB 20 D6
C168: CD BD A0 06 A2 18 18 20 8D
C170: F0 FF A5 FE A6 FD 20 CD 98
C178: BD CE BA 02 D0 1E A9 19 73
C180: 8D BA 02 A2 03 AC B9 02 D8
C188: 18 20 F0 FF A9 97 A0 C7 5B
C190: 20 1E AB AE B9 02 F0 04 D9
C198: CA 8E B9 02 AD 01 D0 38 65
C1A0: C9 36 B0 30 A9 F0 8D F8 A2
C1A8: 07 A9 F0 85 A2 A5 A2 D0 8B
C1B0: FC AD 1F D0 29 01 F0 03 69
C1B8: 4C E1 C0 20 12 C5 20 C4 84
C1C0: C5 A2 03 A0 00 18 20 F0 F5
C1C8: FF AE B7 02 F0 03 CE B7 AB
C1D0: 02 4C F2 C0 4C 10 C0 A9 99
C1D8: 00 8D 1C D0 A9 FA 8D F8 7E
C1E0: 07 CE 01 D0 A9 FF 85 A2 5A
C1E8: A5 A2 D0 FC AD 01 D0 8D 0C
C1F0: 27 D0 D0 ED A9 01 8D 1C FB
C1F8: D0 A9 F0 8D F8 07 AD 1E BD
C200: D0 D0 FB 60 A9 12 20 D2 AC
C208: FF A9 9F 20 D2 FF AE B6 A9
C210: 02 CA 8E B6 02 F0 28 E0 1E
C218: 02 D0 10 A2 18 A0 19 18 87
C220: 20 F0 FF A9 20 20 D2 FF ED
C228: 4C 4C C2 E0 01 D0 10 A2 E8
C230: 18 A0 18 18 20 F0 FF A9 D3
C238: 20 20 D2 FF 4C 4C C2 A2 49
C240: 18 A0 17 18 20 F0 FF A9 E2
C248: 20 20 D2 FF 60 78 A9 16 F3
C250: 8D 14 03 A9 C3 8D 15 03 08
C258: A9 4A 8D 12 D0 AD 11 D0 4C
C260: 29 7F 8D 11 D0 A9 81 8D 31
C268: 1A D0 58 A9 0A 8D B8 02 A7
```

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C270: 8D BA 02 A9 0F 8D B7 02 BA
C278: A9 00 8D B0 02 8D B2 02 A4
C280: 8D 25 D0 85 FB 85 FC 85 8D
C288: FD 85 FE 8D 10 D0 8D 17 1E
C290: D0 8D 20 D0 A9 AA 8D 1D DE
C298: D0 A9 01 8D 1C D0 8D B4 D0
C2A0: 02 8D B1 02 8D 26 D0 8D F5
C2A8: B0 02 8D AF 02 A9 E0 8D B2
C2B0: AB 02 8D AC 02 8D AD 02 D7
C2B8: A2 01 BD FC C7 9D 27 D0 74
C2C0: E8 E0 08 D0 F5 A9 03 8D 93
C2C8: B6 02 20 5A C6 A9 FF 8D F9
C2D0: 15 D0 20 93 C4 A9 05 8D 6B
C2D8: B3 02 A9 F0 8D F8 07 A9 60
C2E0: DE 8D 01 D0 A9 A0 8D 00 F6
C2E8: D0 A9 07 8D 27 D0 AD 1E BB
C2F0: D0 D0 FB A9 7D 8D B5 02 FA
C2F8: AD AB 02 29 FE 8D AB 02 B7
C300: AD AC 02 29 FE 8D AC 02 C0
C308: AD AD 02 29 FE 8D AD 02 CA
C310: A9 27 8D B9 02 60 AD 19 51
C318: D0 8D 19 D0 29 01 D0 07 62
C320: AD 0D DC 58 4C 31 EA AD 26
C328: 12 D0 C9 EA D0 03 4C BC 9C
C330: C3 C9 95 F0 58 C9 6E F0 C5
C338: 2F A2 02 BD B4 C7 9D 00 E3
C340: D0 E8 E0 10 D0 F5 A2 01 55
C348: BD E4 C7 9D F8 07 E8 E0 1A
C350: 08 D0 F5 AD AB 02 8D 10 18
C358: D0 A9 06 8D 21 D0 A9 00 02
C360: 8D 2E D0 A9 6E 4C C3 C3 D8
C368: A2 02 BD C4 C7 9D 00 D0 C5
C370: E8 E0 10 D0 F5 A2 01 BD 72
C378: EC C7 9D F8 07 E8 E0 08 9C
C380: D0 F5 AD AC 02 8D 10 D0 12
C388: A9 95 4C C3 C3 A2 02 BD FD
C390: D4 C7 9D 00 D0 E8 E0 10 75
C398: D0 F5 A2 01 BD F4 C7 9D 1B
C3A0: F8 07 E8 E0 08 D0 F5 AD E6
C3A8: AD 02 8D 10 D0 A9 0E 8D 0C
C3B0: 21 D0 A9 09 8D 2E D0 A9 8B
C3B8: EA 4C C3 C3 A9 0B 8D 21 DA
C3C0: D0 A9 4A 8D 12 D0 CE AE 73
C3C8: 02 D0 0C 20 DA C3 AD B7 CB
C3D0: 02 8D AE 02 20 AD C4 4C EF
C3D8: BC FE A2 01 8A 18 0A A8 8D
C3E0: B9 B4 C7 18 69 02 99 B4 E8
C3E8: C7 90 09 BD AC C7 4D AB 75
C3F0: 02 8D AB 02 E8 E0 08 D0 D0
C3F8: E3 A2 01 8A 18 0A A8 B9 8F
C400: C4 C7 38 E9 01 99 C4 C7 D5
C408: B0 09 BD AC C7 4D AC 02 EF
C410: 8D AC 02 E8 E0 08 D0 E3 D2
C418: A2 01 8A 18 0A A8 B9 D4 9F
C420: C7 18 69 01 99 D4 C7 90 31
C428: 09 BD AC C7 4D AD 02 8D ED
C430: AD 02 E8 E0 04 D0 E3 8A EC
C438: 18 0A A8 B9 D4 C7 38 E9 7B
C440: 01 99 D4 C7 B0 09 BD AC 9B
C448: C7 4D AD 02 8D AD 02 E8 33
C450: E0 07 D0 E3 8A 18 0A A8 42
C458: CE AF 02 D0 19 A9 02 8D FB
C460: AF 02 B9 D4 C7 38 E9 01 8B
C468: 99 D4 C7 B0 09 BD AC C7 8A
C470: 4D AD 02 8D AD 02 CE B1 2B
C478: 02 D0 17 A9 05 8D B1 02 52
C480: A9 01 38 ED B0 02 8D B0 42
C488: 02 AD B0 02 18 69 F8 9D 03
C490: F4 C7 60 A2 18 A9 00 9D AF
C498: 00 D4 CA 10 FA A9 F0 8D 6B
C4A0: 06 D4 A9 11 8D 04 D4 A9 46
C4A8: 0F 8D 18 D4 60 CE B3 02 17
C4B0: D0 23 A9 04 8D B3 02 AE 44
C4B8: B2 02 38 E0 5A 90 05 A2 19
C4C0: 00 8E B2 02 BD 04 C8 8D 1C
C4C8: 01 D4 E8 BD 04 C8 8D 00 9F
C4D0: D4 E8 8E B2 02 60 A2 05 D9
C4D8: A9 00 8D 04 D4 A9 0F 8D 2F
C4E0: 07 D4 A9 0A 8D 08 D4 A9 84
C4E8: F0 8D 0C D4 A9 00 8D 0D 8C
C4F0: D4 A9 21 8D 0B D4 A9 EB 93
C4F8: 85 A2 A5 A2 8D 08 D4 8D 61
C500: 0D D4 D0 F6 A9 00 8D 0B EB
C508: D4 A9 11 8D 04 D4 CA D0 99
C510: C7 60 A9 F6 8D F8 07 20 86
C518: 31 C5 A2 0A A9 F6 18 6D E1
C520: B0 02 8D F8 07 A9 EB 85 7B
C528: A2 A5 A2 D0 FC CA D0 EC 69
C530: 60 A9 00 8D 04 D4 A0 03 44
C538: A9 55 8D 0C D4 8D 0D D4 15
C540: 8D 13 D4 8D 14 D4 A9 21 F6
C548: 8D 0B D4 A9 11 8D 12 D4 E4
C550: A9 60 85 02 A9 C8 85 03 DC
C558: A2 06 8A 48 A2 00 A1 02 1A
C560: 8D 08 D4 8D BB 02 E8 A1 A0
C568: 02 8D 07 D4 E8 A1 02 8D ED
C570: 0F D4 E8 A1 02 8D 0E D4 51
C578: AD BB 02 C9 32 D0 08 A9 62
C580: F0 85 A2 A5 A2 D0 FC A9 59
C588: FA 85 A2 A5 A2 D0 FC A5 67
C590: 02 18 69 04 85 02 A5 03 48
C598: 69 00 85 03 68 AA CA F0 59
C5A0: 05 8A 48 4C 5C C5 A9 20 B0
C5A8: 8D 0B D4 A9 10 8D 12 D4 44
C5B0: A9 E6 85 A2 A5 A2 D0 FC 7F
C5B8: 88 F0 03 4C 38 C5 A9 11 3A
C5C0: 8D 04 D4 60 A2 00 AD B9 91
C5C8: 02 0A A8 8A 2A AA 98 0A 7F
C5D0: A8 8A 2A AA 98 0A A8 8A AE
C5D8: 2A AA 98 0A A8 8A 2A AA 58
C5E0: 98 0A A8 8A 2A AA 98 0A 2E
C5E8: A8 8A 2A AA 98 18 65 FB 03
C5F0: 85 FB 8A 65 FC 85 FC A2 84
C5F8: 00 AD B9 02 0A A8 8A 2A C9
C600: AA 98 0A A8 8A 2A AA 98 ED
C608: 0A A8 8A 2A AA 98 0A A8 65
```

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C610: 8A 2A AA 98 0A A8 8A 2A 6F
C618: AA 98 18 65 FB 85 FB 8A E0
C620: 65 FC 85 FC A2 00 AD B9 0F
C628: 02 0A A8 8A 2A AA 98 0A DE
C630: A8 8A 2A AA 98 18 65 FB 4A
C638: 85 FB 8A 65 FC 85 FC A5 CE
C640: FE 38 C5 FC F0 04 B0 11 F0
C648: 90 07 A5 FD 38 C5 FB B0 2E
C650: 08 A5 FB 85 FD A5 FC 85 A5
C658: FE 60 A9 93 20 D2 FF A9 91
C660: 05 20 D2 FF A2 00 8A 48 CD
C668: A9 DD A0 C6 20 1E AB 68 A9
C670: AA E8 8A 48 E0 03 D0 F0 7C
C678: 68 A9 0F A0 C7 20 1E AB EB
C680: A2 0D A0 00 18 20 F0 FF F9
C688: A9 39 A0 C7 20 1E AB A2 60
C690: 17 A0 00 18 20 F0 FF A9 1B
C698: 39 A0 C7 20 1E AB A9 64 32
C6A0: A0 C7 20 1E AB 60 A9 92 8F
C6A8: 20 D2 FF 20 97 E0 A5 8D 67
C6B0: 29 03 F0 28 48 AC B8 02 A5
C6B8: A2 01 18 20 F0 FF A9 20 4F
C6C0: 20 D2 FF 20 D2 FF 68 AA B9
C6C8: BD A8 C7 8D B8 02 A8 A2 8A
C6D0: 01 18 20 F0 FF A9 92 A0 D7
C6D8: C7 20 1E AB 60 08 0E 12 13
C6E0: DC DC DC DC DC DC DC DC C7
C6E8: 92 A8 20 20 20 20 A8 12 5F
C6F0: DC DC DC 92 A8 20 20 20 23
C6F8: 20 A8 12 DC DC DC 92 A8 A5
C700: 20 20 20 20 A8 12 DC DC F4
C708: DC DC DC DC DC DC 00 99 CE
C710: A8 A8 A8 A8 A8 A8 A8 A8 55
C718: A8 A8 A8 A8 A8 A8 A8 A8 5D
C720: A8 A8 A8 A8 A8 A8 A8 A8 65
C728: A8 A8 A8 A8 A8 A8 A8 A8 6D
C730: A8 A8 A8 A8 A8 A8 A8 A8 75
C738: 00 12 05 20 20 20 20 20 EF
C740: 20 20 20 20 20 20 20 20 41
C748: 20 20 20 20 20 20 20 20 49
C750: 20 20 20 20 20 20 20 20 51
C758: 20 20 20 20 20 20 20 20 59
C760: 20 20 20 00 12 9F C8 49 84
C768: 47 48 3A 20 20 20 20 20 D2
C770: 20 20 20 20 D0 45 4E 47 9C
C778: 55 49 4E 53 20 BA BA BA 09
C780: 20 20 D3 43 4F 52 45 3A F8
C788: 20 20 20 20 20 9D 94 20 7B
C790: 13 00 92 96 4F 4F 00 12 7D
C798: 1C A8 00 12 05 C7 41 4D CA
C7A0: 45 20 CF 56 45 52 21 00 E4
C7A8: 00 0A 13 1C 01 02 04 08 F0
C7B0: 10 20 40 80 00 00 46 55 3D
C7B8: 8C 55 C3 55 FA 55 64 55 BD
C7C0: AA 55 E6 55 00 00 46 75 B8
C7C8: 8C 75 D2 75 1E 75 64 75 80
C7D0: AA 75 DC 75 00 00 64 A5 4D
C7D8: C8 A5 00 A5 64 C8 78 C8 5B
C7E0: FA C8 19 9C 00 F2 F4 F2 35
C7E8: F4 F2 F4 F2 00 F3 F4 F3 95
C7F0: F4 F3 F4 F3 00 F2 F4 F2 9D
C7F8: F4 F3 F4 F8 07 00 03 00 D9
C800: 03 00 01 00 19 1E 15 1F 6F
C808: 19 1E 16 60 00 00 19 1E EC
C810: 16 60 00 00 16 60 10 C3 D0
C818: 10 C3 00 00 10 C3 00 00 BF
C820: 10 C3 00 00 10 C3 00 00 C7
C828: 12 D1 15 1F 16 60 19 1E ED
C830: 00 00 19 1E 19 1E 12 D1 82
C838: 19 1E 12 D1 16 60 12 D1 AD
C840: 19 1E 15 1F 19 1E 10 C3 B6
C848: 00 00 10 C3 00 00 10 C3 EF
C850: 00 00 12 D1 15 1F 16 60 DE
C858: 19 1E 00 00 19 1E 01 01 C8
C860: 19 1E 12 D1 21 87 19 1E 5B
C868: 2A 3E 1F A5 32 3C 25 A2 CB
C870: 2A 3E 1F A5 32 3C A9 B1 67
C878: 85 02 A9 C8 85 03 A9 00 A4
C880: 85 04 A9 3C 85 05 A2 0B 28
C888: A0 00 B1 02 91 04 C8 C0 FB
C890: 40 D0 F7 A5 02 18 69 40 03
C898: 85 02 A5 03 69 00 85 03 BA
C8A0: A5 04 18 69 40 85 04 A5 3B
C8A8: 05 69 00 85 05 CA D0 D8 16
C8B0: 60 00 00 00 00 00 00 00 11
C8B8: 00 00 00 08 00 00 08 00 C8
C8C0: 00 26 00 00 15 00 00 15 11
C8C8: 00 00 55 41 01 55 54 05 0F
C8D0: 55 54 11 55 50 01 55 50 D7
C8D8: 01 55 50 01 55 50 01 55 7C
C8E0: 50 01 55 50 00 55 40 00 6D
C8E8: 15 00 01 51 00 00 01 50 A1
C8F0: 00 00 00 00 00 00 00 00 F0
C8F8: 00 00 00 08 00 00 08 00 09
C900: 00 26 00 00 15 00 00 15 50
C908: 00 10 55 40 05 55 50 05 5D
C910: 55 54 01 55 51 01 55 50 08
C918: 01 55 50 01 55 50 01 55 BB
C920: 50 01 55 50 00 55 40 00 AC
C928: 15 00 00 11 50 01 50 00 EF
C930: 0A 00 00 00 00 00 00 00 3A
C938: 00 00 00 00 00 00 00 00 38
C940: 00 70 00 00 38 00 00 1C 05
C948: 00 00 1F F0 80 7F FC 81 D6
C950: FF 2F C7 FF FF FF FF FC 44
C958: 7F FF F0 00 04 20 00 02 EE
C960: 40 01 55 80 00 2A 00 00 A1
C968: 00 00 00 00 00 00 00 00 68
C970: 00 00 00 00 00 00 00 00 70
C978: 00 00 00 00 00 00 00 00 78
C980: 00 0E 00 00 1C 00 00 38 E2
C988: 00 0F F8 00 3F FE 01 F4 C4
C990: FF 81 FF FF E3 3F FF FF 35
C998: 0F FF FE 04 20 00 02 40 0D
C9A0: 00 01 AA 80 00 54 00 00 21
C9A8: 00 00 00 00 00 00 00 00 A8
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
C9B0: 00 00 00 00 00 00 00 00 B0
C9B8: 00 00 00 00 00 00 00 00 B8
C9C0: 00 20 00 01 32 00 03 FF 17
C9C8: 20 07 FF 60 1F FF F0 3F 9F
C9D0: FF FC FF FF FF 00 00 00 CD
C9D8: 00 00 00 00 00 00 00 00 D8
C9E0: 00 00 00 00 00 00 00 00 E0
C9E8: 00 00 00 00 00 00 00 00 E8
C9F0: FF 00 00 00 00 00 00 00 F0
C9F8: 00 00 00 08 00 00 08 00 09
CA00: 00 26 00 00 15 00 00 15 50
CA08: 00 05 55 54 11 55 51 11 7F
CA10: 55 51 01 55 50 00 55 40 F2
CA18: 00 00 0C 0C C3 00 00 00 F3
CA20: C0 0C 0C 0C 00 C0 C0 00 86
CA28: 00 00 00 00 00 00 00 00 28
CA30: 00 00 26 00 00 19 00 00 6F
CA38: 3B 00 10 7F 41 05 FF D4 1E
CA40: 05 FF D4 01 FF D0 01 FF EC
CA48: D0 01 FF D0 01 FF D0 01 BD
CA50: FF D0 01 7F 50 00 5D 40 8F
CA58: 00 15 00 00 11 00 00 51 CF
CA60: 40 01 51 50 01 40 50 00 D4
CA68: 00 00 00 00 00 00 00 00 68
CA70: 0A 00 00 00 00 00 00 00 7A
CA78: 00 00 00 00 00 00 00 00 78
CA80: 00 26 00 00 19 00 00 3B FA
CA88: 00 00 7F 40 01 FF D0 05 1F
CA90: FF D4 11 FF D1 11 FF D1 2B
CA98: 01 FF D0 01 FF D0 01 FF 3D
CAA0: D0 01 7F 50 00 5D 40 00 DF
CAA8: 15 00 00 11 00 01 51 50 71
CAB0: 01 04 3E 00 1C FF 80 2F BF
CAB8: FF C0 F3 FF E2 6C 20 9C 79
CAC0: 00 C0 C0 00 00 00 00 00 42
CAC8: 00 00 00 00 00 00 00 00 C8
CAD0: 00 00 00 00 00 00 00 00 D0
CAD8: 00 00 00 00 00 00 00 00 D8
CAE0: 00 00 00 00 00 00 00 00 E0
CAE8: 00 00 00 00 00 00 00 00 E8
CAF0: 00 04 3E 00 1C FF 80 2F FE
CAF8: FF C8 7B FF E4 E4 40 98 DF
CB00: 00 33 00 00 00 00 00 00 33
CB08: 00 00 00 00 00 00 00 00 08
CB10: 00 00 00 00 00 00 00 00 10
CB18: 00 00 00 00 00 00 00 00 18
CB20: 00 00 00 00 00 00 00 00 20
CB28: 00 00 00 00 00 00 00 00 28
CB30: 00 00 3E 00 00 41 00 18 C7
CB38: 3E 0C 24 00 12 42 1C 21 38
CB40: 81 36 41 80 EB 81 BE 08 ED
CB48: 3D A2 42 45 A5 42 A5 A9 E6
CB50: 42 95 B1 24 8D A1 18 85 CA
CB58: A1 00 85 A1 00 85 60 81 88
CB60: 0A 30 7E 0C 18 42 18 00 97
CB68: C3 00 03 81 C0 01 00 80 F2
CB70: 00 00 FF 70
```

QUICK CHANGE

FROM PAGE 52

```
·5 REM *** QUICK CHANGE *** BUCK CHILDRES
 S ***                                    IE
·10 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                    DC
·15 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA LINE:":J=50000:L=50:C=11             HF
·20 PRINTCHR$(19)TAB(31)L:PRINT:FORB=0TOC
 :READA:IFA<0ORA>255THEN30                JJ
·25 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN
 35                                       BO
·30 PRINT"ERROR IN DATA LINE:"L:END       HL
·35 X=0:J=J+12:L=L+5:IFL<671THEN20        DH
·40 PRINT"THE DATA IS OK AND LOADED.":PRI
 NT                                       HH
·45 PRINT"SYS 5[4"0"] TO SWITCH ON AND OF
 F.":END                                  OG
·50 DATA169,106,162,132,160,195,204,1,3,2
 08,6,169,1515                            NE
·55 DATA139,162,135,160,227,141,0,3,140,1
 ,3,76,1187                               HP
·60 DATA251,199,173,0,2,201,65,144,4,201,
 91,144,1475                              HL
·65 DATA3,76,139,227,32,237,199,32,217,19
 9,133,253,1747                           AI
·70 DATA162,96,134,251,142,138,2,157,0,20
 1,232,208,1723                           AP
·75 DATA250,232,169,39,141,248,201,32,79,
 199,169,91,1850                          LM
·80 DATA133,252,141,247,201,162,10,32,251
 ,199,133,254,2015                        MC
·85 DATA166,252,169,100,32,171,199,32,66,
 199,32,7,1425                            PE
·90 DATA200,32,228,255,240,245,133,212,20
 1,13,208,44,2011                         CI
·95 DATA173,96,201,240,227,169,32,166,252
 ,157,0,4,1717                            CO
·100 DATA166,251,48,13,169,192,162,24,160
 ,171,133,251,1740                        GG
·105 DATA132,252,76,159,195,173,192,201,2
 08,86,162,139,1975                       NE
·110 DATA134,199,32,251,199,76,52,196,201
 ,20,208,39,1607                          BO
·115 DATA174,247,201,48,3,76,120,195,169,
 0,162,32,1427                            DL
·120 DATA157,192,201,202,16,250,164,254,3
 2,162,199,132,1961                       DM
·125 DATA254,140,247,201,169,192,162,171,
 133,251,134,252,2306                     MA
·130 DATA76,164,195,166,254,224,26,144,3,
 76,171,195,1694                          HK
·135 DATA230,254,166,251,157,0,201,230,25
```

```
1,230,252,32,2254                                   OF
•140 DATA210,255,165,252,16,3,141,247,201
,76,164,195,1925                                    JH
•145 DATA32,240,199,162,105,32,251,199,16
9,0,162,9,1560                                      AD
•150 DATA157,0,2,172,233,201,208,3,157,23
0,201,202,1766                                      EE
•155 DATA16,242,174,233,201,169,100,157,2
51,4,173,134,1854                                   OO
•160 DATA2,157,251,216,32,66,199,32,7,200
,32,228,1422                                        AN
•165 DATA255,240,245,201,13,208,39,173,23
3,201,240,20,2068                                   HN
•170 DATA173,235,201,201,2,144,229,32,181
,199,173,238,2008                                   NI
•175 DATA201,208,107,173,239,201,208,102,
169,255,141,238,2242                                DC
•180 DATA201,141,239,201,141,230,201,76,2
34,196,201,20,2081                                  EC
•185 DATA208,30,172,233,201,240,9,32,162,
199,140,233,1859                                    NJ
•190 DATA201,76,60,196,169,32,141,251,4,1
60,79,32,1401                                       IO
•195 DATA162,199,200,132,254,76,244,195,2
01,45,208,20,1936                                   BP
•200 DATA174,231,201,208,159,141,231,201,
32,210,255,238,2281                                 OH
•205 DATA233,201,32,181,199,76,60,196,201
,48,144,140,1711                                    GE
•210 DATA201,58,176,136,174,232,201,224,5
,176,129,157,1869                                   LH
•215 DATA0,2,32,210,255,238,232,201,238,2
33,201,76,1918                                      IL
•220 DATA78,196,32,237,199,32,217,199,173
,248,201,32,1844                                    GE
•225 DATA79,199,172,192,201,208,8,162,77,
32,140,199,1669                                     KG
•230 DATA76,18,197,162,87,32,140,199,162,
96,32,251,1452                                      JH
•235 DATA199,162,96,32,145,199,162,119,32
,251,199,174,1770                                   AD
•240 DATA236,201,173,237,201,32,205,189,1
69,45,32,210,1930                                   DP
•245 DATA255,173,230,201,208,12,174,238,2
01,173,239,201,2305                                 LA
•250 DATA32,205,189,76,59,197,162,128,32,
251,199,162,1692                                    FO
•255 DATA38,32,251,199,32,66,199,32,7,200
,32,228,1316                                        EI
•260 DATA255,201,89,240,7,201,78,208,239,
76,120,195,1909                                     FJ
•265 DATA169,1,162,8,141,240,201,142,241,
201,32,237,1775                                     MF
•270 DATA199,141,138,2,141,245,201,32,127
,199,160,0,1585                                     KH
•275 DATA177,253,208,3,76,116,164,32,15,1
99,177,253,1673                                     ME
•280 DATA170,32,15,199,177,253,142,250,20
1,141,251,201,2032                                  OC
•285 DATA205,237,201,144,7,208,23,236,236
,201,176,18,1892                                    MK
•290 DATA32,205,189,32,15,199,162,0,161,2
53,240,82,1570                                      LA
•295 DATA32,15,199,76,152,197,205,239,201
,144,9,208,1677                                     NN
•300 DATA199,236,238,201,144,2,208,192,32
,205,189,169,2015                                   KM
•305 DATA32,32,210,255,32,15,199,169,39,1
62,201,141,1487                                     FB
•310 DATA249,201,141,253,201,134,252,169,
96,162,0,133,1991                                   DI
•315 DATA251,142,242,201,142,246,201,161,
253,240,23,32,2134                                  II
•320 DATA88,198,173,242,201,205,246,201,2
08,88,162,0,2012                                    KB
•325 DATA161,251,240,91,32,15,199,76,211,
197,142,244,1859                                    IN
•330 DATA201,32,240,199,173,245,201,208,1
6,32,15,199,1761                                    HD
•335 DATA165,253,166,254,141,240,201,142,
241,201,76,94,2174                                  OM
•340 DATA197,162,0,32,251,199,169,19,141,
119,2,169,1460                                      IE
•345 DATA13,141,120,2,141,121,2,141,122,2
,169,4,978                                          KO
•350 DATA133,198,76,116,164,32,127,199,32
,15,199,32,1323                                     DJ
•355 DATA15,199,162,0,32,15,199,161,253,2
08,249,76,1569                                      ND
•360 DATA249,197,32,7,200,32,15,199,76,19
9,197,172,1575                                      CP
•365 DATA242,201,32,162,199,141,245,201,1
85,192,201,240,2241                                 GE
•370 DATA233,32,195,198,200,76,76,198,166
,212,208,64,1858                                    CL
•375 DATA174,253,201,142,249,201,162,18,2
01,131,240,5,1977                                   IA
•380 DATA202,201,143,208,3,142,253,201,20
1,128,144,40,1866                                   HL
•385 DATA56,233,127,170,160,255,202,240,8
,200,185,158,1994                                   BK
•390 DATA160,16,250,48,245,200,185,158,16
0,48,14,238,1722                                    EC
•395 DATA243,201,32,156,198,169,0,141,243
,201,76,133,1793                                    FG
•400 DATA198,56,233,128,72,162,0,193,251,
208,26,173,1700                                     KI
•405 DATA248,201,201,10,240,16,166,212,24
0,7,201,62,1804                                     IL
•410 DATA240,8,76,189,198,205,249,201,208
,3,238,246,2061                                     IH
•415 DATA201,230,251,238,242,201,104,174,
244,201,48,11,2145                                  OO
•420 DATA208,12,166,211,224,79,144,3,142,
244,201,76,1710                                     NG
•425 DATA210,255,173,243,201,240,2,104,10
```

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4,104,104,162,1902                                    PJ
·430 DATA192,142,244,201,162,61,32,251,19
9,174,250,201,2109                                    MO
·435 DATA173,251,201,32,205,189,169,32,32
,210,255,32,1781                                      BI
·440 DATA127,199,169,3,133,252,164,252,17
7,253,240,8,1977                                      II
·445 DATA32,88,198,230,252,76,254,198,76,
116,164,230,1914                                      HC
·450 DATA253,208,2,230,254,96,201,8,240,2
51,201,11,1955                                        BH
·455 DATA240,247,201,16,240,243,201,19,24
0,239,201,24,2111                                     HA
·460 DATA240,235,201,27,240,231,201,32,24
0,227,201,35,2110                                     DJ
·465 DATA240,223,201,56,240,219,201,59,24
0,215,169,0,2063                                      BK
·470 DATA133,198,173,141,2,201,4,208,204,
165,203,201,1833                                      DF
·475 DATA64,240,243,160,0,201,39,240,24,1
60,9,201,1581                                         BA
·480 DATA10,240,18,160,18,201,17,240,12,1
60,27,201,1304                                        KP
·485 DATA18,240,6,160,36,201,62,208,169,1
41,248,201,1690                                       OD
·490 DATA162,16,185,249,200,240,121,32,17
1,199,232,200,2007                                    LK
·495 DATA76,114,199,173,240,201,174,241,2
01,133,253,134,2139                                   KM
·500 DATA254,76,15,199,32,251,199,162,0,1
89,96,201,1674                                        MM
·505 DATA240,7,32,210,255,232,76,145,199,
169,34,76,1675                                        BF
·510 DATA210,255,169,20,32,210,255,136,20
8,250,96,157,1998                                     MK
·515 DATA0,4,173,134,2,157,0,216,96,169,0
,162,1113                                             HO
·520 DATA2,133,122,134,123,141,232,201,32
,121,0,32,1273                                        FL
·525 DATA107,169,165,20,174,235,201,157,2
36,201,232,165,2062                                   ON
·530 DATA21,157,236,201,232,142,235,201,9
6,162,11,160,1854                                     LB
·535 DATA0,24,32,240,255,169,42,160,39,32
,164,199,1356                                         IF
·540 DATA162,147,76,251,199,32,68,229,169
,0,133,198,1664                                       LN
·545 DATA133,199,133,212,133,216,96,189,2
5,200,240,250,2026                                    KL
·550 DATA32,210,255,232,76,251,199,32,225
,255,208,238,2213                                     EL
·555 DATA104,104,169,0,141,138,2,32,68,22
9,76,116,1179                                         OC
·560 DATA164,13,83,89,83,53,48,55,50,53,0
,17,708                                               KM
·565 DATA13,79,76,68,32,69,78,84,82,89,63
,32,765                                               DJ
·570 DATA0,13,13,78,69,87,32,69,78,84,82,
89,694                                                FO
·575 DATA63,32,0,13,13,18,65,82,69,32,89,
79,555                                                HM
·580 DATA85,32,83,85,82,69,63,32,40,89,47
,78,785                                               LK
·585 DATA41,0,13,13,18,32,84,79,79,32,76,
79,546                                                HK
·590 DATA78,71,32,13,13,0,13,13,69,82,65,
83,532                                                EB
·595 DATA69,32,34,0,13,13,84,85,82,78,32,
34,556                                                OP
·600 DATA0,13,13,73,78,84,79,32,34,0,13,1
3,432                                                 PJ
·605 DATA84,72,69,32,82,65,78,71,69,63,32
,0,717                                                PN
·610 DATA13,13,76,73,78,69,83,32,0,69,78,
68,652                                                BG
·615 DATA0,79,78,0,79,70,70,0,32,69,82,65
,624                                                  AH
·620 DATA83,69,32,0,13,13,13,67,84,82,76,
32,564                                                JD
·625 DATA65,32,61,32,65,76,76,13,67,84,82
,76,729                                               GB
·630 DATA32,68,32,61,32,68,65,84,65,13,67
,84,671                                               EN
·635 DATA82,76,32,78,32,61,32,78,79,82,77
,65,774                                               LG
·640 DATA76,13,67,84,82,76,32,81,32,61,32
,81,717                                               JG
·645 DATA85,79,84,69,83,13,67,84,82,76,32
,82,836                                               CB
·650 DATA32,61,32,82,69,77,83,19,0,160,14
2,143,900                                             HP
·655 DATA146,141,129,140,160,0,160,160,12
9,140,140,160,1605                                    BM
·660 DATA160,160,0,160,160,146,133,141,14
7,160,160,0,1527                                      HM
·665 DATA160,160,132,129,148,129,160,160,
0,160,145,149,1632                                    MI
·670 DATA143,148,133,147,160,0,0,0,0,0,0,
0,731                                                 EP
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MOUNTAINEER MACK

FROM PAGE 18

Starting address in hex: 2000
Ending address in hex: 2D5B
SYS to start: 8192

***Flankspeed* required for entry! See page 103.**

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2000: A9 08 20 D2 FF A9 93 20 02
2008: D2 FF A9 00 8D 20 D0 A9 AC
2010: 0F 8D 21 D0 20 49 2A 8D BF
2018: 0F D4 EA EA A9 80 8D 12 9B
2020: D4 AD 0E DC 29 FE 8D 0E 51
2028: DC A5 01 29 FB 85 01 A2 F9
2030: 00 BD 00 D0 9D 00 30 E8 75
2038: E0 D8 D0 F5 A2 00 BD 00 19
2040: D1 9D 00 31 E8 E0 FF D0 7B
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2048: F5 A2 00 BD 81 20 C9 21 2B
2050: F0 07 9D D8 31 E8 4C 4B 70
2058: 20 A2 00 BD 96 20 C9 21 7A
2060: F0 07 9D EC 31 E8 4C 5B A4
2068: 20 EA 20 2F 2A EA EA EA AD
2070: A5 01 09 04 85 01 AD 0E 66
2078: DC 09 01 8D 0E DC 4C AA CE
2080: 20 08 1C 2A 08 1C 2A 08 45
2088: FF 08 1C 3E 1E 3C 18 18 75
2090: FF 00 00 18 34 21 66 7E E2
2098: FF 00 00 00 0C 3C 7E 7E DD
20A0: FF 00 00 00 00 00 00 00 A0
20A8: 00 21 AD 18 D0 29 F0 18 92
20B0: 69 0C 8D 18 D0 20 DB 26 BE
20B8: A9 0C 8D 86 02 4C 80 22 73
20C0: 00 28 00 00 AA 00 00 AA 3E
20C8: 00 80 AA 02 80 AA 02 40 63
20D0: 28 01 F0 3C 0F 55 55 55 36
20D8: 3F FF FC 01 55 40 00 FF AB
20E0: 00 00 AA 00 00 FF 00 03 8E
20E8: FF C0 0F FF F0 0F 00 F0 A9
20F0: 0F 00 F0 0A 00 A0 2A 00 C5
20F8: A8 AA 00 AA AA 00 AA 00 4C
2100: 00 28 00 08 AA 20 08 AA AD
2108: 20 04 AA 10 0C AA 30 04 D1
2110: 28 10 0C 3C 30 05 55 50 6B
2118: 0F FF F0 01 55 40 00 FF AE
2120: 00 00 AA 00 00 FF 00 03 CD
2128: FF C0 0F FF F0 03 C3 C0 70
2130: 00 FF 00 00 AA 00 02 AA 87
2138: 80 0A AA A0 0A AA A0 00 63
2140: 0C 00 0C 3F 00 1F 3F 80 76
2148: 3F 7F 00 1E 7A 01 9E 30 6F
2150: 03 C8 00 67 C0 01 FF 80 C5
2158: 03 FF 80 03 FF C0 07 FF A6
2160: C0 07 FF E0 03 FF E0 01 ED
2168: FF E0 01 FF F0 03 FF F0 2F
2170: 07 FF F0 0F FF E0 0F FF 67
2178: C0 07 CB C0 03 81 80 00 D1
2180: 00 10 00 00 38 00 00 7C 45
2188: 00 00 FE 00 01 FF 00 00 88
2190: 7C 00 00 FE 00 01 FF 00 0D
2198: 03 FF 80 00 7C 00 00 FE 97
21A0: 00 01 FF 00 03 FF 80 07 2C
21A8: FF C0 00 FE 00 01 FF 00 69
21B0: 03 FF 80 07 FF C0 0F FF 0B
21B8: E0 00 38 00 00 38 00 00 0A
21C0: 00 00 00 00 00 00 00 00 C0
21C8: 00 00 00 00 00 00 00 00 C8
21D0: 00 00 00 00 00 00 03 00 D3
21D8: 00 33 00 00 33 00 00 73 B2
21E0: 00 00 73 30 00 77 30 03 2F
21E8: 77 70 03 77 70 03 77 70 A6
21F0: 0A 7B 70 0A AA 68 2A AA D8
21F8: AA 2A AA AA 08 88 88 00 3C
2200: 00 00 00 00 00 00 00 00 00
2208: 00 00 00 00 00 00 00 00 08
2210: 00 00 0E 00 00 1F 07 F0 35
2218: 1B FF F8 FF FF F8 FF FF 25
2220: FC 1F FF FC FF FF FC 0F 45
2228: FF FE 03 FF FE 01 FF FE 29
2230: 03 C0 7E 03 80 3F 07 80 BC
2238: FF 3F 03 FF 3E 03 FE 00 BA
2240: 00 00 80 00 01 C0 00 03 85
2248: E0 00 06 B0 00 07 F0 00 D7
2250: 03 E0 00 01 C0 00 03 80 79
2258: 00 0F 00 00 00 00 03 FF 6A
2260: 80 07 FF C0 03 FF 80 00 2C
2268: 00 00 03 FF 80 07 FF C0 B3
2270: 43 FF 80 60 00 00 7F FF 14
2278: 80 3F FF C0 1F FF 80 00 98
2280: A9 13 20 D2 FF A2 00 A0 73
2288: 00 20 A1 23 20 D2 FF C8 29
2290: C0 28 D0 F5 A0 00 E8 E0 AA
2298: 17 D0 EE 20 A5 22 4C 07 AA
22A0: 24 AD 1B D4 60 A2 17 A0 1D
22A8: 00 20 D0 2B 20 ED 26 A2 9B
22B0: 00 BD 7F 2C F0 07 20 D2 05
22B8: FF E8 4C B1 22 60 AD 00 CF
22C0: DC A0 00 A2 00 4A B0 01 DC
22C8: 88 4A B0 01 C8 4A B0 01 12
22D0: CA 4A B0 01 E8 4A 8E 9A F3
22D8: 42 8C 9B 42 60 20 78 2A A8
22E0: 20 78 2A AD 75 42 F0 0B 05
22E8: A9 01 8D 9B 42 20 9B 25 DF
22F0: 4C E3 22 20 1D 27 A9 83 D4
22F8: 8D F8 07 A2 00 BD 77 42 A0
2300: C9 30 D0 08 E8 E0 04 D0 71
2308: F4 4C F4 2A A9 00 85 FB 93
2310: A9 28 85 FD A9 04 85 FE 97
2318: 85 FC A0 00 B1 FD 91 FB 78
2320: E6 FD A5 FD C9 00 D0 02 45
2328: E6 FE A5 FE C9 07 D0 06 5A
2330: A5 FD C9 98 F0 0D E6 FB 17
2338: A5 FB C9 00 D0 DE E6 FC 37
2340: 4C 1C 23 20 9C 2A 4C FB FA
2348: 22 A9 97 85 FB A9 6F 85 CB
2350: FD A9 07 85 FE 85 FC A0 A6
2358: 00 B1 FD 91 FB C6 FD A5 FF
2360: FD C9 FF D0 02 C6 FE A5 66
2368: FE C9 03 D0 06 A5 FD C9 78
2370: FF F0 0D C6 FB A5 FB C9 9C
2378: FF D0 DE C6 FC 4C 59 23 B4
2380: 20 5C 26 20 73 2B A9 0C 97
2388: 8D 86 02 A2 00 A0 00 20 02
2390: D0 2B AD 82 42 F0 06 20 16
2398: B2 29 4C A0 23 20 35 2D 07
23A0: 60 20 A1 22 C9 3B 90 F9 74
23A8: C9 40 B0 F5 60 A0 00 A9 04
23B0: 30 99 6C 42 C8 C0 04 D0 87
23B8: F8 A9 3F 8D 15 D0 8D 1D B8
23C0: D0 A9 3D 8D 17 D0 A9 00 97
23C8: 8D 81 42 8D 8D 42 8D 27 2C
23D0: D0 8D 29 D0 8D 10 D0 8D 25
23D8: 80 42 A9 05 8D 1C D0 8D 52
23E0: 2A D0 8D 2B D0 A9 06 8D A2
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23E8: 25 D0 A9 02 8D 26 D0 A9 B8
23F0: 0B 8D 28 D0 A9 85 8D F9 39
23F8: 07 A9 87 8D FA 07 A9 86 F0
2400: 8D FB 07 8D FC 07 60 20 A2
2408: AD 23 20 58 28 20 B0 27 71
2410: 20 61 29 AD 81 42 F0 08 25
2418: 20 86 28 A9 00 8D 81 42 E1
2420: AC 8A 42 F0 03 4C DD 22 D9
2428: 20 BE 22 AD 9A 42 F0 08 AC
2430: C9 01 F0 3D C9 FF F0 33 17
2438: AD 9B 42 F0 08 C9 01 F0 78
2440: 1A C9 FF F0 03 4C 0D 24 95
2448: AD 75 42 C9 09 B0 06 20 57
2450: 9B 25 4C 0D 24 20 49 23 1B
2458: 4C 0D 24 AD 75 42 C9 01 06
2460: 90 06 20 9B 25 4C 0D 24 55
2468: 4C 20 24 20 77 24 4C 0D 0E
2470: 24 20 A3 24 4C 0D 24 A2 9C
2478: 00 AD 00 D0 C9 18 D0 07 B0
2480: AD 10 D0 29 01 F0 0D AD E4
2488: 00 D0 C9 00 D0 03 20 95 AC
2490: 24 CE 00 D0 60 AD 10 D0 43
2498: 29 FE 8D 10 D0 A9 FF 8D 66
24A0: 00 D0 60 A2 00 AD 10 D0 03
24A8: 29 01 F0 07 AD 00 D0 C9 13
24B0: 29 F0 0D AD 00 D0 C9 FF 20
24B8: D0 03 20 C1 24 EE 00 D0 52
24C0: 60 AD 10 D0 09 01 8D 10 57
24C8: D0 A9 00 8D 00 D0 60 A9 AB
24D0: 08 8D 03 D0 AD 10 D0 29 F1
24D8: FD 8D 10 D0 20 A1 22 C9 F2
24E0: A5 90 15 AD 10 D0 09 02 C5
24E8: 8D 10 D0 20 A1 22 C9 20 25
24F0: B0 F9 8D 02 D0 4C 02 25 6F
24F8: 20 A1 22 C9 19 90 F9 8D D7
2500: 02 D0 60 78 AD 14 03 85 F5
2508: A3 AD 15 03 85 A4 A9 1A 5F
2510: 8D 14 03 A9 25 8D 15 03 29
2518: 58 60 AD 1E D0 29 01 F0 88
2520: 05 A9 01 8D 8A 42 AD 9B 73
2528: 42 D0 0D AD 9A 42 D0 08 AB
2530: A9 83 8D F8 07 4C 66 25 C2
2538: EE 74 42 AD 74 42 C9 05 11
2540: D0 24 AD 8A 42 D0 08 20 A8
2548: 5E 2A A9 10 8D 04 D4 A9 9A
2550: 00 8D 74 42 AD F8 07 C9 0C
2558: 83 D0 06 EE F8 07 4C 66 54
2560: 25 A9 83 8D F8 07 AD 82 70
2568: 42 F0 08 A9 08 8D 03 D0 B6
2570: 4C 98 25 EE 71 42 AD 71 3C
2578: 42 CD 72 42 D0 1A A9 00 D1
2580: 8D 71 42 A2 00 EE 03 D0 27
2588: AD 03 D0 C9 D6 D0 03 20 9E
2590: CF 24 E8 EC 7F 42 D0 ED DA
2598: 6C A3 00 AD 9B 42 30 0F 73
25A0: AD 01 D0 18 69 08 8D 01 38
25A8: D0 CE 75 42 4C BB 25 AD DA
25B0: 01 D0 38 E9 08 8D 01 D0 0C
25B8: EE 75 42 A9 01 20 48 2D 9F
25C0: 60 20 CE 25 20 EB 25 20 86
25C8: 43 26 20 17 26 60 20 A1 B1
25D0: 22 C9 88 90 F9 C9 8A B0 D4
25D8: F5 8D FD 07 C9 89 D0 05 8A
25E0: A9 08 4C E7 25 A9 09 8D 2C
25E8: 2C D0 60 AD 10 D0 29 FB F9
25F0: 8D 10 D0 20 A1 22 C9 80 8D
25F8: 90 12 AD 10 D0 09 04 8D C4
2600: 10 D0 20 A1 22 C9 1E B0 5D
2608: F9 4C 13 26 20 A1 22 C9 35
2610: 20 90 F9 8D 04 D0 60 AD 2B
2618: 10 D0 29 DF 8D 10 D0 20 90
2620: A1 22 C9 80 90 12 AD 10 8E
2628: D0 09 20 8D 10 D0 20 A1 52
2630: 22 C9 1E B0 F9 4C 3F 26 96
2638: 20 A1 22 C9 20 90 F9 8D 1E
2640: 0A D0 60 20 A1 22 C9 20 49
2648: 90 F9 C9 C3 B0 F5 8D 06 9A
2650: D0 20 A1 22 C9 1B B0 F9 94
2658: 8D 08 D0 60 AD 05 D0 C9 6C
2660: BE 90 0B A9 08 8D 05 D0 CF
2668: 20 EB 25 4C 83 26 AD 82 BF
2670: 42 F0 07 AD 05 D0 C9 08 FF
2678: F0 09 AD 05 D0 18 69 08 7F
2680: 8D 05 D0 AD 07 D0 C9 BE F1
2688: 90 0E A9 08 8D 07 D0 8D CB
2690: 09 D0 20 43 26 4C B0 26 17
2698: AD 82 42 F0 07 AD 07 D0 88
26A0: C9 08 F0 0C AD 07 D0 18 0D
26A8: 69 08 8D 07 D0 8D 09 D0 E6
26B0: AD 0B D0 C9 BE 90 0E A9 0B
26B8: 08 8D 0B D0 20 17 26 20 A7
26C0: CE 25 4C DA 26 AD 82 42 74
26C8: F0 07 AD 0B D0 C9 08 F0 0D
26D0: 09 AD 0B D0 18 69 08 8D 7A
26D8: 0B D0 60 AD 11 D0 29 EF BD
26E0: 8D 11 D0 60 AD 11 D0 09 49
26E8: 10 8D 11 D0 60 A9 00 8D FF
26F0: 86 02 60 A9 B8 8D 01 D0 9B
26F8: A9 08 8D 05 D0 A9 50 8D 95
2700: 07 D0 8D 09 D0 A9 88 8D FE
2708: 0B D0 A9 96 8D 00 D0 A9 2C
2710: 83 8D F8 07 AD 10 D0 29 D8
2718: FE 8D 10 D0 60 78 A5 A3 A7
2720: 8D 14 03 A5 A4 8D 15 03 B4
2728: 58 60 A9 33 8D 70 42 A0 9E
2730: 00 A9 30 99 68 42 C8 C0 D7
2738: 04 D0 F8 A0 00 99 77 42 F9
2740: C8 C0 08 D0 F8 A9 31 8D 04
2748: 7B 42 A9 00 8D 71 42 8D 7E
2750: 74 42 8D 75 42 A9 04 8D 87
2758: 7F 42 A9 02 8D 72 42 AD B5
2760: 10 D0 29 F7 09 10 8D 10 19
2768: D0 A9 31 8D 76 42 60 A2 5D
2770: 0C A0 0B 20 D0 2B A0 00 E4
2778: 20 6F 2C 60 A2 0D A0 0D F1
2780: 20 D0 2B A0 12 20 6F 2C 0B
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2788: 60 A2 0D A0 0C 20 D0 2B 61
2790: A0 20 20 6F 2C 60 A2 0B 1B
2798: A0 0F 20 D0 2B A0 2F 20 54
27A0: 6F 2C 60 A2 0D A0 0C 20 19
27A8: D0 2B A0 39 20 6F 2C 60 9A
27B0: 20 ED 26 A2 17 A0 07 20 66
27B8: D0 2B AD 70 42 20 D2 FF 08
27C0: A2 17 A0 12 20 D0 2B A0 E9
27C8: 00 B9 6C 42 20 D2 FF C8 EC
27D0: C0 04 D0 F5 A2 17 A0 22 D8
27D8: 20 D0 2B A0 00 B9 68 42 F9
27E0: 20 D2 FF C8 C0 04 D0 F5 28
27E8: A2 18 A0 06 20 D0 2B AD 14
27F0: 76 42 20 D2 FF A2 18 A0 F7
27F8: 10 20 D0 2B A0 00 B9 7B FA
2800: 42 20 D2 FF C8 C0 04 D0 93
2808: F5 A2 18 A0 22 20 D0 2B 97
2810: A0 00 B9 77 42 20 D2 FF 17
2818: C8 C0 04 D0 F5 60 20 BE AB
2820: 22 B0 FB 60 A9 FC A2 01 99
2828: 9D 00 D0 E8 E8 E0 0D D0 27
2830: F7 60 A9 00 8D 85 42 A9 31
2838: 13 20 D2 FF 20 35 2D EE AF
2840: 85 42 AD 85 42 C9 0F D0 27
2848: F3 60 20 1D 27 A9 83 8D BB
2850: F8 07 A9 25 20 48 2D 60 15
2858: 20 27 2D AD 80 42 F0 19 47
2860: AD 8D 42 F0 0B 20 E4 26 05
2868: 20 1F 2B A9 00 8D 8D 42 D9
2870: 20 96 27 20 A3 27 4C 7C 02
2878: 28 20 7C 27 20 51 2C 20 22
2880: 2A 27 20 2E 2D 60 20 27 F4
2888: 2D AD 70 42 C9 33 D0 06 E9
2890: 20 E4 26 20 9B 2B 20 89 4C
2898: 27 20 51 2C A9 00 8D 75 0A
28A0: 42 AD 76 42 18 69 01 C9 95
28A8: 37 90 02 A9 31 8D 76 42 93
28B0: A0 00 A9 30 99 77 42 C8 47
28B8: C0 04 D0 F8 AD 7B 42 18 CA
28C0: 69 01 C9 37 90 08 EE 7F 33
28C8: 42 EE 7F 42 A9 31 8D 7B 9F
28D0: 42 20 2E 2D 60 AD 6B 42 4A
28D8: C9 35 D0 35 A9 30 8D 6B B0
28E0: 42 EE 6A 42 AD 6A 42 C9 E2
28E8: 3A 90 2B A9 30 8D 6A 42 F2
28F0: EE 69 42 AD 69 42 C9 3A E8
28F8: 90 1C A9 30 8D 69 42 EE A7
2900: 68 42 AD 68 42 C9 3A 90 97
2908: 0D A9 30 8D 68 42 4C 16 89
2910: 29 A9 35 8D 6B 42 AD 68 69
2918: 42 CD 6C 42 90 2F F0 06 8D
2920: 20 4E 29 4C 4D 29 AD 69 91
2928: 42 CD 6D 42 90 1F F0 03 8B
2930: 4C 20 29 AD 6A 42 CD 6E 5C
2938: 42 90 12 F0 03 4C 20 29 A6
2940: AD 6B 42 CD 6F 42 90 05 B0
2948: F0 03 4C 20 29 60 A2 00 D4
2950: BD 68 42 9D 6C 42 E8 E0 CE
2958: 04 D0 F5 A9 01 8D 8D 42 2B
2960: 60 A2 00 BD 77 42 DD 7B 34
2968: 42 D0 0D E8 E0 04 D0 F3 1B
2970: 20 4A 28 A9 01 8D 81 42 FE
2978: AD 7B 42 38 E9 01 CD 77 4C
2980: 42 D0 13 AD 78 42 C9 39 12
2988: D0 0C AD 79 42 C9 30 D0 99
2990: 05 A9 01 8D 82 42 60 20 13
2998: F3 26 20 C1 25 20 CF 24 CD
29A0: 20 B0 27 20 03 25 AD 1E AC
29A8: D0 A9 00 8D 8A 42 20 E4 82
29B0: 26 60 A9 0C 8D 86 02 A9 AC
29B8: 13 20 D2 FF 20 FA 29 A2 A5
29C0: 00 20 EB 29 E8 EC 84 42 92
29C8: D0 F7 20 FA 29 20 16 2A 36
29D0: A2 00 20 F2 29 E8 E0 03 7C
29D8: D0 F8 A2 00 20 F6 29 E8 6E
29E0: E0 06 D0 F8 60 A9 40 20 FB
29E8: D2 FF 60 20 A1 23 20 D2 F3
29F0: FF 60 EE 83 42 60 CE 84 B9
29F8: 42 60 A2 00 20 E5 29 E8 56
2A00: EC 83 42 D0 F7 60 A9 00 85
2A08: 8D 82 42 A9 03 8D 83 42 5A
2A10: A9 22 8D 84 42 60 A2 00 33
2A18: BD 00 04 C9 00 D0 05 A9 23
2A20: 0E 4C 26 2A A9 0C 9D 00 1E
2A28: D8 E8 E0 C8 D0 EA 60 A2 52
2A30: 00 BD 40 2A C9 21 F0 07 3B
2A38: 9D 00 30 E8 4C 31 2A 60 F6
2A40: FF FF FF FF FF FF FF FF 40
2A48: 21 A0 18 A9 00 99 00 D4 3A
2A50: 88 10 FA A9 0F 8D 18 D4 17
2A58: A9 FF 8D 0E D4 60 A9 28 A4
2A60: 8D 05 D4 A9 44 8D 06 D4 1E
2A68: A9 0D 8D 01 D4 A9 01 8D BA
2A70: 00 D4 A9 11 8D 04 D4 60 C6
2A78: A9 82 8D 05 D4 A9 88 8D CB
2A80: 06 D4 A9 01 8D 01 D4 A9 13
2A88: 00 8D 00 D4 A9 81 8D 04 A7
2A90: D4 A9 09 20 48 2D A9 80 D7
2A98: 8D 04 D4 60 A2 05 BD 00 C4
2AA0: D0 C9 0A B0 05 A9 C0 4C B1
2AA8: AD 2A 38 E9 08 9D 00 D0 19
2AB0: E8 E8 E0 0D D0 E8 20 16 60
2AB8: 2A CE 79 42 CE 79 42 AD A5
2AC0: 79 42 C9 2E D0 20 A9 38 47
2AC8: 8D 79 42 CE 78 42 AD 78 C1
2AD0: 42 C9 2F D0 11 A9 39 8D 5E
2AD8: 78 42 CE 77 42 C9 2F D0 E5
2AE0: 05 A9 30 8D 77 42 A2 16 BF
2AE8: A0 00 20 D0 2B 20 35 2D 28
2AF0: 20 B0 27 60 A9 25 20 48 80
2AF8: 2D CE 70 42 AD 70 42 C9 D1
2B00: 30 D0 0B 20 B0 27 A9 01 AE
2B08: 8D 80 42 4C 0A 24 20 DB CE
2B10: 26 20 2E 2D 4C 0D 24 A2 D1
2B18: 17 A0 12 20 D0 2B 60 A9 08
2B20: 04 8D 8E 42 20 17 2B A9 8E
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
2B28: 20 A2 04 20 D2 FF CA 10 BC
2B30: FA A9 04 20 48 2D 20 17 A5
2B38: 2B A0 00 B9 6C 42 20 D2 5F
2B40: FF C8 C0 04 D0 F5 20 4F 04
2B48: 2B CE 8E 42 10 D6 60 A9 04
2B50: 82 8D 01 D4 A9 09 8D 05 7B
2B58: D4 A9 1E 8D 0F D4 A9 15 25
2B60: 8D 04 D4 A9 04 20 48 2D 0A
2B68: A9 14 8D 04 D4 A9 FF 8D C3
2B70: 0F D4 60 20 D5 28 EE 79 3B
2B78: 42 EE 79 42 AD 79 42 C9 98
2B80: 3A 90 17 A9 30 8D 79 42 85
2B88: EE 78 42 AD 78 42 C9 3A 9E
2B90: 90 08 A9 30 8D 78 42 EE 3A
2B98: 77 42 60 A2 08 A0 0C 20 2A
2BA0: D0 2B A0 48 20 6F 2C A9 EA
2BA8: 30 8D 8F 42 A9 09 8D 90 09
2BB0: 42 20 4F 2B A9 10 8D 04 D8
2BB8: D4 20 D5 28 20 B0 27 CE 72
2BC0: 90 42 10 ED EE 8F 42 AD FF
2BC8: 8F 42 CD 76 42 D0 DD 60 30
2BD0: 18 20 F0 FF 60 78 AD 14 94
2BD8: 03 85 A3 AD 15 03 85 A4 F4
2BE0: A9 FA 8D 14 03 A9 2B 8D 8C
2BE8: 15 03 58 60 A9 88 8D 05 7E
2BF0: D4 8D 06 D4 A9 00 8D 8B F0
2BF8: 42 60 AD 8B 42 C9 00 F0 D1
2C00: 26 C9 05 F0 1A C9 14 F0 CE
2C08: 1E C9 19 F0 12 C9 28 F0 EE
2C10: 26 C9 2E F0 0A C9 50 F0 34
2C18: 30 EE 8B 42 6C A3 00 A9 BE
2C20: 80 8D 04 D4 4C 19 2C A9 42
2C28: 01 8D 01 D4 8D 00 D4 A9 98
2C30: 81 8D 04 D4 4C 19 2C A9 53
2C38: 34 8D 01 D4 A9 01 8D 00 08
2C40: D4 A9 81 8D 04 D4 4C 19 0C
2C48: 2C A9 00 8D 8B 42 6C A3 89
2C50: 00 20 6F 27 20 E4 26 20 52
2C58: EC 2B 20 D5 2B 20 1E 28 F7
2C60: 20 1D 27 A9 80 8D 04 D4 55
2C68: 20 DB 26 20 32 28 60 20 85
2C70: ED 26 B9 CE 2C F0 07 20 51
2C78: D2 FF C8 4C 72 2C 60 20 7F
2C80: 20 4D 45 4E 3A 20 33 20 2F
2C88: 20 20 20 48 49 47 48 3A 44
2C90: 20 30 30 30 30 20 20 20 D1
2C98: 20 20 53 43 4F 52 45 3A 90
2CA0: 20 30 30 30 30 20 20 20 E1
2CA8: 4D 54 4E 3A 20 31 20 20 64
2CB0: 45 4C 45 56 2E 3A 20 30 96
2CB8: 30 30 30 20 20 43 55 52 74
2CC0: 52 2E 20 45 4C 45 56 3A C8
2CC8: 20 30 30 30 30 00 50 52 4C
2CD0: 45 53 53 20 46 49 52 45 04
2CD8: 20 42 55 54 54 4F 4E 00 D6
2CE0: 54 4F 20 53 54 41 52 54 34
2CE8: 20 47 41 4D 45 00 46 4F B9
2CF0: 52 20 4E 45 58 54 20 4C 10
2CF8: 45 56 45 4C 00 47 41 4D FB
2D00: 45 20 4F 56 45 52 00 46 E8
2D08: 4F 52 20 41 20 4E 45 57 16
2D10: 20 47 41 4D 45 00 42 4F DC
2D18: 4E 55 53 20 41 57 41 52 5B
2D20: 44 45 44 20 21 21 00 20 70
2D28: DB 26 20 24 28 60 20 06 1D
2D30: 2A 20 97 29 60 A9 0C 8D DE
2D38: 86 02 A0 00 20 A1 23 20 66
2D40: D2 FF C8 C0 28 D0 F5 60 EB
2D48: 8D 87 42 A2 1C A0 00 C8 C7
2D50: D0 FD CA D0 F8 CE 87 42 4C
2D58: D0 F1 60 00 7B
```

128 TO 64 AUTOBOOT

FROM PAGE 50

128-64.BAS

```
·10 CK=0                                                    HH
·20 READ A:IF A=256 THEN 40                                 FN
·30 CK=CK+A:GOTO 20                                         OF
·40 IF CK<>18681 THEN PRINT"ERROR IN DATA
 ":END                                                      CM
·50 OPEN 2,8,2,"0:128-64.BIN,P,W"                           NL
·60 PRINT#2,CHR$(0);CHR$(128);                              GK
·70 RESTORE                                                 IO
·80 READ A:IF A=256 THEN CLOSE2:END                         HM
·90 PRINT#2,CHR$(A);:GOTO80                                 KG
·32768 DATA 16,128,16,128,195,194,205,56                    CC
·32776 DATA 48,0,0,0,0,0,162,5                              AI
·32784 DATA 162,5,142,4,128,142,5,128                       JE
·32792 DATA 142,6,128,142,22,208,32,163                     AM
·32800 DATA 253,32,80,253,32,21,253,32                      NI
·32808 DATA 91,255,88,32,83,228,32,191                      EG
·32816 DATA 227,169,0,141,32,208,141,33                     BK
·32824 DATA 208,169,147,32,210,255,169,11                   NP
·32832 DATA 141,137,2,76,80,128,85,48                       JF
·32840 DATA 62,77,48,0,48,58,42,0                           HK
·32848 DATA 169,15,162,8,160,15,32,186                      FC
·32856 DATA 255,160,0,185,70,128,240,7                      BE
·32864 DATA 153,0,128,200,76,91,128,169                     LI
·32872 DATA 5,162,0,160,128,32,189,255                      OP
·32880 DATA 32,192,255,169,15,32,195,255                    OO
·32888 DATA 169,2,162,8,160,1,32,186                        HA
·32896 DATA 255,160,0,185,76,128,240,7                      NK
·32904 DATA 153,0,128,200,76,131,128,169                    MO
·32912 DATA 3,162,0,160,128,32,189,255                      AF
·32920 DATA 169,0,32,213,255,169,2,32                       LN
·32928 DATA 195,255,162,251,154,76,139,22
 7,0,256                                                    KB
```

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1-0.BAS

```
·10 OPEN15,8,15                                          AM
·20 OPEN5,8,5,"#"                                        DA
·30 PRINT#15,"B-P:"5;0                                   OH
·40 PRINT#5,CHR$(67);CHR$(66);CHR$(77); :
  REM  * CBM CODE *                                      EO
·50 PRINT#5,CHR$(0);CHR$(0);CHR$(0);CHR$(
 0);                                                     GC
·60 PRINT"[CLEAR]ENTER BOOT MESSAGE":GOSU
 B1000                                                   CO
·70 PRINT#5,CHR$(0);                                     HN
·80 PRINT#5,"128-64.BIN";                                MG
·90 PRINT#5,CHR$(0);CHR$(76);CHR$(75);CHR
 $(226);CHR$(0);                                         DO
·100 PRINT#15,"U2:"5;0;1;0                               KF
·110 CLOSE5:CLOSE15                                      BF
·120 END                                                 IC
·1000 PRINT"  USE '[BACKARROW]' WHEN DONE
 ."                                                      MN
·1005 R$="":POKE212,1                                    DE
·1020 GETG$:IFG$=""THEN1020                              NB
·1030 IFG$=CHR$(95)THEN1050                              ML
·1040 R$=R$+G$:POKE216,1:PRINTG$;:GOTO102
 0                                                       CF
·1050 POKE212,0:PRINT#5,R$;                              HE
·1060 RETURN                                             IM
```

VAULT OF TERROR
FROM PAGE 58

```
·1 REM VAULT V2.6 BY C.M. BLAKEMORE                      HE
·2 POKE53280,.:POKE53281,.:POKE808,234:GO
 TO123                                                   NB
·3 VL=FC:ONFC+1GOSUB49,49,58,60,61                       JL
·4 RETURN                                                IM
·5 GOSUB3:ONFC+1GOSUB72,62,67,70,71:RETUR
 N                                                       HJ
·6 ONFC+1GOSUB74,75,76,77:RETURN                         LB
·7 ONFC+1GOSUB78,79,80,81:RETURN                         ML
·8 LP=FC:ONFC+1GOSUB82,86,88,90:RETURN                   AA
·9 ONFC+1GOSUB91,93,95,96:RETURN                         IA
·10 PRINT"[CLEAR][DOWN][RVSOFF] [s M][s O
 ][34"[c Y]"][s P][s N]"                                 GN
·11 PRINT" [s M][c H]"TAB(37)"[c N][s N]"                GF
·12 PRINT" [s M][c H]"TAB(37)"[c N][s N]"                GF
·13 PRINT" [s M][c G][3" "][28"[c @]"][3"
  "][c M][s N]                                           EN
·14 PRINT" [s M][c G]  [c M][c *][RVSON][
 26" "][RVSOFF][sEP][c G]  [c M][s N]                    PO
·15 PRINT" [s M][c G][SS] [c M] [c *][RVS
 ON][24" "][RVSOFF][sEP] [c G] [SS][c M][
 s N]                                                    NF
·16 PRINT" [s M][c G]  [c M] [c M][s M][2
 2"[c T]"][s N][c G] [c G]  [c M][s N]                   LH
·17 PRINT" [s M][c G]  [c M] [c M][s M] [
 s O][18"[c Y]"][s P][SS][s N][c G] [c G]
   [c M][s N]                                            EA
·18 PRINT"  [c G]  [c M] [c M][s M] [c G]
 [c M][c *][RVSON][14" "][RVSOFF][sEP][c
 G][c M] [s N][c G] [c G] [SS][c M]                      HI
·19 PRINT"  [c G]  [c M] [c M][s M] [c G]
 [c M][c M][s M][12" "][s N][c G][c G][c
 M] [s N][c G] [c G]  [c M]                              HK
·20 PRINT"  [s O][c Y][c Y][s P] [c M][s
 M] [c G][c M][c M][s M][s O][10"[c T]"][
 s P][s N][c G][c G][c M] [s N][c G] [s O
 ][c Y][c Y][s P]                                        FE
·21 PRINT"  [c G][RVSON][s U][s I][RVSOFF
 ][c M] [c M][SS] [RVSON][s U][s I][RVSOF
 F][c M][s M][c G][RVSON][s T][8"[c I]"][
 s Y][RVSOFF][c M][s N][c G][RVSON][s U][
 s I][RVSOFF] [SS][c G] [c G][RVSON][s U]
 [s I][RVSOFF][c M]                                      PA
·22 PRINT"  [c G][RVSON][s J][s K][RVSOFF
 ][c M] [c M]  [RVSON][s J][s K][RVSOFF][
 c M] [RVSON][s W][s T][RVSOFF][s M][RVSO
 N].[4"[s C]"].[RVSOFF][s N][RVSON][s Y][
 s W][RVSOFF] [c G][RVSON][s J][s K][RVSO
 FF]  [c G] [c G][RVSON][s J][s K][RVSOFF
 ][c M]                                                  EH
·23 PRINT"  [s L][c P][c P][s @] [c M][SS
 ] [c G][c M][c M][s N][c G][RVSON][s T][
 RVSOFF][s N][RVSON][s G][RVSOFF][4" "][R
 VSON][s H][RVSOFF][s M][RVSON][s Y][RVSO
 FF][c M][s M][c G][c G][c M] [SS][c G] [
 s L][c P][c P][s @]"                                    GL
·24 PRINT" [s N][c G][SS] [c M] [c M][s N
 ] [c G][c M][c M][s N][c G][RVSON][s T][
 RVSOFF][s N][6"[c T]"][s M][RVSON][s Y][
 RVSOFF][c M][s M][c G][c G][c M] [s M][c
  G][SS][c G] [SS][c M][s M]                             IE
·25 PRINT" [s N][c G]  [c M][SS][c M][s N
 ] [c G][c M][c M][s N][s L][sEP][8"[c T]
 "][c *][s @][s M][c G][c G][c M] [s M][c
  G] [c G]  [c M][s M]                                   BK
·26 PRINT" [s N][c G][SS][SS][c M][SS][c
 M][s N] [c G][c M][c M][s N][12"[c T]"][
 s M][c G][c G][c M] [s M][c G] [c G]  [c
  M][s M]                                                JE
·27 PRINT" [s N][c G] [SS][c M][SS][c M][
 s N] [s L][s @][s N][14" "][s M][s L][s
 @] [s M][c G] [c G] [SS][c M][s M]                      KC
·28 PRINT" [s N][c G][SS][SS][c M] [c M][
 s N][c T][SS] [16"[c T]"]  [c T][s M][c
 G] [c G]  [c M][s M]                                    EH
·29 PRINT" [s N][c G][SS][SS][c M][SS][c
 M][24" "][c G] [c G]  [c M][s M]                        EK
·30 PRINT" [s N][c G][SS][SS][c M] [s N]"
```

```
TAB(32)"[s M][SS][c G][SS] [c M][s M]"   EK
·31 PRINT" [s N][s L][c P][c P][s @][s N]
 "TAB(33)"[s M][s L][c P][c P][s @][s M]
"                                        MG
·32 PRINT"[39"[c Y]"]"                   BI
·33 PRINT"[RVSON][RED][3" "]";D$(CD);"  [
SS][5" "]#[SS]$[SS]%[SS]&[SS]'[SS]([SS])
[SS]* +[7" "]";D$(CD);"  [RVSOFF]";      MO
·34 PRINTL$(DD);:RETURN                  OH
·35 PRINT"[HOME][DOWN][RVSON][c Y][s P][D
OWN][LEFT][LEFT]";:FORX=.TO19:PRINT" [c
M][DOWN][LEFT][LEFT]";:NEXT:PRINT"[c P][
s @][DOWN][LEFT][LEFT] [RVSOFF][sEP]":RE
TURN                                     AP
·36 PRINT"[HOME][8"[DOWN]"]";TAB(8)"[RVSO
N][c Y][s P][DOWN][LEFT][LEFT]";:FORX=.T
O8:PRINT" [c M][DOWN][LEFT][LEFT]";:NEXT
:PRINT"[c P][s @][DOWN][LEFT][LEFT][RVSO
FF][sEP]"                                JA
·37 RETURN                               IM
·38 PRINT"[HOME][11"[DOWN]"]";TAB(13)"[RV
SON][s P][DOWN][LEFT]";:FORX=.TO3:PRINT"
[c M][DOWN][LEFT]";:NEXT:PRINT"[s @][DOW
N][LEFT][RVSOFF][sEP]"                   NM
·39 RETURN                               IM
·40 PRINT"[HOME][13"[DOWN]"]";TAB(16)"[RV
SON][s P][DOWN][LEFT][s @][DOWN][LEFT][R
VSOFF][sEP]";                            AA
·41 RETURN                               IM
·42 PRINT"[HOME][DOWN][RVSON]";TAB(38)"[s
 O][DOWN][LEFT]";:FORX=.TO19:PRINT"[c G]
[DOWN][LEFT]";:NEXT:PRINT"[s L][DOWN][LE
FT][RVSOFF][c *]":RETURN                 JB
·43 PRINT"[HOME][8"[DOWN]"]"TAB(30)"[RVSO
N][s O][c Y][DOWN][LEFT][LEFT]";:FORX=.T
O8:PRINT"[c G] [DOWN][LEFT][LEFT]";:NEXT
:PRINT"[s L][c P][DOWN][LEFT][RVSOFF][c
*]                                       EF
·44 RETURN                               IM
·45 PRINT"[HOME][11"[DOWN]"]";TAB(26)"[RV
SON][s O][DOWN][LEFT]";:FORX=.TO3:PRINT"
[c G][DOWN][LEFT]";:NEXT:PRINT"[s L][DOW
N][LEFT][RVSOFF][c *]"                   IN
·46 RETURN                               IM
·47 PRINT"[HOME][13"[DOWN]"]";TAB(23)"[RV
SON][s O][DOWN][LEFT][s L][DOWN][LEFT][R
VSOFF][c *]"                             AO
·48 RETURN                               IM
·49 PRINT"[HOME][5"[DOWN]"]";:FORX=.TO3:P
RINTTAB(6);                              FH
·50 PRINT"[s O][c Y][s P][s O][c Y][s P][
s O][c Y][s P][s O][c Y][s P][s O][c Y][
s P][s O][c Y][s P][s O][c Y][s P][s O][
c Y][s P][s O][c Y][s P][s O]"           PN
·51 PRINTTAB(6)"[s L][c P][s @][s L][c P]
[s @][s L][c P][s @][s L][c P][s @][s L]
[c P][s @][s L][c P][s @][s L][c P][s @]
[s L][c P][s @][s L][c P][s @][s L]"     PM
·52 PRINTTAB(6)"[s P][s O][c Y][s P][s O]
[c Y][s P][s O][c Y][s P][s O][c Y][s P]
[s O][c Y][s P][s O][c Y][s P][s O][c Y]
[s P][s O][c Y][s P][s O][c Y][s P]"     NN
·53 PRINTTAB(6)"[s @][s L][c P][s @][s L]
[c P][s @][s L][c P][s @][s L][c P][s @]
[s L][c P][s @][s L][c P][s @][s L][c P]
[s @][s L][c P][s @][s L][c P][s @]"     AA
·54 NEXT                                 IA
·55 PRINTTAB(6)"[s O][c Y][s P][s O][c Y]
[s P][s O][c Y][s P][s O][c Y][s P][s O]
[c Y][s P][s O][c Y][s P][s O][c Y][s P]
[s O][c Y][s P][s O][c Y][s P][s O]"     MG
·56 PRINTTAB(6)"[s L][c P][s @][s L][c P]
[s @][s L][c P][s @][s L][c P][s @][s L]
[c P][s @][s L][c P][s @][s L][c P][s @]
[s L][c P][s @][s L][c P][s @][s L]"     PM
·57 RETURN                               IM
·58 PRINT"[HOME][9"[DOWN]"]";:FORX=.TO4:P
RINTTAB(12);"[s P][c Y][s P][c Y][s P][c
 Y][s P][c Y][s P][c Y][s P][c Y][s P][c
 Y][s P][c Y]"                           BM
·59 PRINTTAB(12);"[c Y][s P][c Y][s P][c
Y][s P][c Y][s P][c Y][s P][c Y][s P][c
Y][s P][c Y][s P]":NEXT:RETURN           AI
·60 PRINT"[HOME][12"[DOWN]"]";:FORX=.TO4:
PRINTTAB(15);"[10"[cEP]"]":NEXT:RETURN   AC
·61 PRINT"[HOME][14"[DOWN]"]";:PRINTTAB(1
8)"[4"[c +]"]":RETURN                    JC
·62 PRINT"[HOME][10"[DOWN]"]";TAB(15)"[RV
SON][10":"]":PRINTTAB(15)"[RVSON]:[RVSOF
F][8"[c Z]"][RVSON]:"                    MO
·63 PRINTTAB(15)"[RVSON]:[RVSOFF][c Z][s
O][4"[c Y]"][s P][c Z][RVSON]:":PRINTTAB
(15)"[RVSON]:[RVSOFF][c Z][c G][4"[s C]"
][c M][c Z][RVSON]:"                     NP
·64 PRINTTAB(15)"[RVSON]:[RVSOFF][c Z][s
L][4"[c P]"][s @][c Z][RVSON]:":PRINTTAB
(15)"[RVSON]:[RVSOFF][7"[c Z]"][RVSON][s
 B]:"                                    KJ
·65 PRINTTAB(15)"[RVSON]:[RVSOFF][7"[c Z]
"][s S][RVSON]:"                         NM
·66 FORX=.TO5:PRINTTAB(15)"[RVSON]:[RVSOF
F][8"[c Z]"][RVSON]:":NEXT:RETURN        OK
·67 PRINT"[HOME][11"[DOWN]"]";:PRINTTAB(1
7)"[RVSON][6":"]":PRINTTAB(17)"[RVSON]:[
RVSOFF][4"[c Z]"][RVSON]:"               FK
·68 PRINTTAB(17)"[RVSON]:[RVSOFF][c Z][s
C][s C][c Z][RVSON]:":PRINTTAB(17)"[RVSO
N]:[RVSOFF][3"[c Z]"][s Q][RVSON]:"      OG
·69 FORX=.TO3:PRINTTAB(17)"[RVSON]:[RVSOF
F][4"[c Z]"][RVSON]:":NEXT:RETURN        OO
·70 PRINT"[HOME][13"[DOWN]"]";TAB(19)"[c
D][c F]":FORX=.TO2:PRINTTAB(19)"[c Z][c
Z]":NEXT:RETURN                          JM
·71 PRINT"[HOME][14"[DOWN]"]";TAB(19)"[c
-][RVSON][c -]":RETURN                   PN
·72 PRINT"[HOME]":FORX=.TO21:PRINT"[s V][
```

```
s V]"TAB(38)"[s +]":NEXT                                    LJ
·73 PRINT"[s V][s N][RVSON][36"[c +]"][RV
SOFF][s M]";:GOSUB62:RETURN                                 GO
·74 PRINT"[HOME][23"[DOWN]"]";TAB(12)"[RV
SON][sEP][s O][12"[c Y]"][s P][c *]";:RE
TURN                                                        NA
·75 PRINT"[HOME][20"[DOWN]"]";TAB(14)"[RV
SON][sEP][s O][8"[c Y]"][s P][c *]";:RET
URN                                                         JF
·76 PRINT"[HOME][17"[DOWN]"]";TAB(16)"[RV
SON][sEP][s O][4"[c Y]"][s P][c *]";:RET
URN                                                         DH
·77 PRINT"[HOME][15"[DOWN]"]";TAB(18)"[RV
SON][sEP][s O][s P][c *]";:RETURN                           FK
·78 PRINT"[HOME]"TAB(12)"[c *][RVSON][s L
][12"[c P]"][s @][RVSOFF][sEP]":RETURN                      JL
·79 PRINT"[HOME][7"[DOWN]"]"TAB(14)"[c *]
[RVSON][s L][8"[c P]"][s @][RVSOFF][sEP]
":RETURN                                                    HH
·80 PRINT"[HOME][10"[DOWN]"]";TAB(16)"[c
*][RVSON][s L][4"[c P]"][s @][RVSOFF][sE
P]":RETURN                                                  LM
·81 PRINT"[HOME][12"[DOWN]"]";TAB(18)"[c
*][RVSON][s L][s @][RVSOFF][sEP]":RETURN                    HB
·82 PRINT"[HOME]";:PRINTTAB(14)"[RVSON][c
 M]"TAB(25)"[RVSON][c G]"                                   IK
·83 FORX=.TO6:PRINTTAB(14)"[RVSON][c M][1
0"[s E]"][c G]":PRINTTAB(14)"[RVSON][c M
]"TAB(25)"[RVSON][c G]"                                     EN
·84 PRINTTAB(14)"[RVSON][c M]"TAB(25)"[RV
SON][c G]":NEXT                                             NA
·85 PRINTTAB(14)"[RVSON][c M][10"[s E]"][
c G]":PRINTTAB(14)"[RVSON][c M]"TAB(25)"
[RVSON][c G][HOME]":RETURN                                  FO
·86 PRINT"[HOME][7"[DOWN]"]";:FORX=.TO6                     GI
·87 PRINTTAB(16)"[RVSON][s Y][6"[s E]"][s
 T]":PRINTTAB(16)"[RVSON][s Y]"TAB(23)"[
RVSON][s T]":NEXT:RETURN                                    OM
·88 PRINT"[HOME][10"[DOWN]"]";:FORX=.TO7                    JA
·89 PRINTTAB(18)"[RVSON][c D][c I][c I][c
 F]":NEXT:RETURN                                            IL
·90 PRINT"[HOME][13"[DOWN]"]";:FORX=.TO2:
PRINTTAB(19)"[c Q][c W]":NEXT:RETURN                        LP
·91 PRINT"[HOME][22"[DOWN]"]";TAB(11)"[RV
SON][sEP][s N][14"-"][s M][c *]"                            OD
·92 PRINTTAB(10)"[RVSON][sEP][s N][16"-"]
[s M][c *][HOME]":RETURN                                    JN
·93 PRINT"[HOME][18"[DOWN]"]";TAB(14)"[RV
SON][sEP][s N][8"="][s M][c *]":PRINTTAB
(14)"[RVSON][s O][10"[c T]"][s P]"                          OA
·94 PRINTTAB(14)"[RVSON][s O][c T][c R][6
"[c T]"][c R][c T][s P]":RETURN                             BM
·95 PRINT"[HOME][16"[DOWN]"]"TAB(16)"[RVS
ON][sEP][s N][4"="][s M][c *]":PRINTTAB(
16)"[RVSON][s O][c R][4"[c T]"][c R][s P
]":RETURN                                                   LO
·96 PRINT"[HOME][15"[DOWN]"]"TAB(17)"[RVS
ON][sEP][4"="][c *]":PRINTTAB(17)"[RVSON
 ][s O][c R][c T][c T][c R][s P]":RETURN                    FB
·97 CEM=FNTE(.):POKE648,CEM:PRINTL$(DD);:
GOSUB10                                                     OM
·98 FC=4:VL=FC:LP=FC:LV=CD-1+4*-(CD=1):RV
=CD+1+4*(CD=4)                                              ED
·99 EBM=FNCP(.):IFEBM>-1ANDEBM<256THEN102                   HG
·100 IFFCTHENFC=FC-1:GOTO99                                 KL
·101 RETURN                                                 IM
·102 EL=FNCP(LV):ER=FNCP(RV)                                PA
·103 IF(DL(EBM,.))THEN105                                   DH
·104 GOSUB3:FC=FC-1:ON1-(FC<.)GOTO99,113                    BD
·105 IFDL(EL,.)ANDFC<4THENONFC+1GOSUB35,3
6,38,40                                                     LA
·106 IFDL(ER,.)ANDFC<4THENONFC+1GOSUB42,4
3,45,47                                                     DD
·107 FORD=1TO5:IF(DL(EBM,.)ANDBO(D))THENO
NDGOSUB9,6,7,8,5                                            AN
·108 PRINT"[RVSOFF]";:NEXT:FC=FC-1:IFFC>-
1THEN99                                                     AK
·109 IFDL(CL,2)=.THEN113                                    JE
·110 FORX=.TO8:POKEXR,22:POKEYR,.:POKEPR,
.:SYSPLOT                                                   BB
·111 IF(DL(CL,2)ANDBO(X))THENPRINTTAB(X*4
+3);OA$(X)                                                  JI
·112 NEXT                                                   IA
·113 GOSUB116                                               CM
·114 CSM=FNSW(.):POKE53272,(PEEK(53272)AN
D15)ORCSM:POKEFNPM(U),7:RETURN                              OB
·115 :                                                      DI
·116 IFFCANDVLTHENVL=VL-1                                   OI
·117 D=61:POKEFNMP(1),D:POKEFNMP(2),D:POK
EFNMP(3),D:POKEFNMP(5),D                                    KF
·118 EL=.:ER=.:FORX=VLTO.STEP-1:FC=FNCM(X
):IFDL(FC,1)=.THEN122                                       CD
·119 FC=DL(FC,1)-1:EL=(ELORSP(X+4)):IFX>L
PTHENER=(ERORSP(X+4))                                       HI
·120 MB=SP(X)-1:FORD=1TOLEN(SB$(X,FC)):PO
KEFNMP(MB+D),ASC(MID$(SB$(X,FC),D,1))                       DG
·121 POKEBC+SP(X)+D,CS(FC):NEXT                             AL
·122 NEXT:POKEV+21,EL:POKEV+27,ER:RETURN                    JA
·123 POKE56578,PEEK(56578)OR3:POKE56576,(
PEEK(56576)AND252)                                          NN
·124 POKE53272,PEEK(53272)AND15:POKE648,1
92:POKE53272,(PEEK(53272)AND240)OR12                        JC
·125 POKE53270,PEEK(53270)AND247                            FP
·126 PRINTCHR$(147):GOSUB234:GOSUB238                       EP
·127 DIMDL(255,2),BO(15),SP(7),SB$(3,7),D
$(4),L$(6),OA$(8),CS(7),M(15),MH(15)                        FJ
·128 DIMHC(2):X=.:D=.:FC=.:CL=17:CD=2:VL=
.:EL=.:ER=.:VS=.                                            OC
·129 D(1)=1:D(2)=16:D(3)=-1:D(4)=-16:CS(.
)=9:CS(1)=2:CS(2)=6:CS(3)=9:CS(4)=4                         II
·130 CS(5)=14:CS(6)=13:CS(7)=1:LP=.:P=.:L
=1:LF=10                                                    GG
·131 SP(.)=.:SP(1)=4:SP(2)=6:SP(3)=7:SP(4
)=15:SP(5)=48:SP(6)=64:SP(7)=128                            BP
·132 TGL=16:CSM=.:CEM=192:V=53248                           FL
·133 D$(1)="E":D$(2)="S":D$(3)="W":D$(4)=
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"N"                                                              OC
·134 NJ=255:FJ=254:LJ=251:RJ=247:BJ=253:U
S=239:MU=237:U=.                                                 KG
·135 TL=388:DD=6:PLOT=65520:AR=780:XR=781
:YR=782:PR=783:S=54272:BC=V+38                                   JB
·136 RU=156:CU=142:ALL=511:HX=157:WL=17:C
C=204:CR$=CHR$(13)                                               KE
·137 DEFFNCP(X)=FC*D(CD)+(CL+D(X)):DEFFNS
W(X)=(TGL-CSM)                                                   JA
·138 DEFFNTE(X)=(TL-CEM):DEFFNCM(X)=X*D(C
D)+CL:DEFFNMP(X)=CEM*256+1016+X                                  BM
·139 DEFFNPM(X)=55296+972+(X*2)                                  EM
·140 FORX=.TO15:BO(X)=2[UPARROW]X:NEXT:L$
(.)="[WHITE]":L$(1)="[c 8]":L$(2)="[c 5]
":L$(3)="[c 4]"                                                  PM
·141 L$(4)="[c 4]":L$(5)="[BLUE]":L$(6)="
[BLACK]":HC(.)=2:HC(1)=8:HC(2)=10                                LJ
·142 FORX=.TO239:READD:DL(X,.)=D:NEXT                            FE
·143 FORX=.TO8:READA$:OA$(X)=A$:NEXTX                            JK
·144 FORX=.TO15:READA:M(X)=A:NEXTX                               DF
·145 FORX=3TO.STEP-1:FORD=.TO7:READA$:SB$
(X,D)=A$:NEXTD,X                                                 GC
·146 FORX=.TO8                                                   KJ
·147 A=INT(RND(1)*93+34):IFDL(A,.)=.THEN1
47                                                               AF
·148 DL(A,1)=M(X):M(X)=A:MH(X)=X*4+1:NEXT                        DJ
·149 FORX=9TO15                                                  NN
·150 A=INT(RND(1)*96+142):IFDL(A,.)=.THEN
150                                                              KH
·151 DL(A,1)=M(X):M(X)=A:MH(X)=X*4+1:NEXT                        DJ
·152 D=52288:FORX=.TO767:READA:POKED+X,A:
NEXT:FORX=.TO63:POKE53055+X,.:NEXT                               LH
·153 PRINT"[c 4]":FORX=.TO8:POKEXR,15:POK
EYR,.:POKEPR,.:SYSPLOT                                           PB
·154 PRINTTAB(X*4+2);OA$(X)                                      BE
·155 NEXT                                                        IA
·156 PRINT"[7"[DOWN]"][RED][RVSON] F1/ ST
ART NEW GAME  F2/ LOAD OLD GAME";:POKE19
8,.                                                              DL
·157 GETA$:IFA$<>CHR$(133)ANDA$<>CHR$(137
)THEN157                                                         HK
·158 IFA$=CHR$(137)THENGOSUB267                                  CN
·159 DL(CC,1)=BO(8)                                              IK
·160 POKEV+21,.:POKEV+23,127:POKEV+29,15:
POKEV,150:POKEV+1,193:POKEV+2,151                                CH
·161 POKEV+3,151:POKEV+4,119:POKEV+5,109:
POKEV+6,167:POKEV+7,109:POKEV+8,164                              PE
·162 POKEV+9,174:POKEV+10,164:POKEV+11,13
3:POKEV+12,168:POKEV+13,152                                      IK
·163 POKEV+14,172:POKEV+15,160                                   PH
·164 GOSUB322:GOSUB97:IT=TI+1000                                 JF
·165 JOY=PEEK(56321)                                             LF
·166 IFRND(1)>.93THENPOKES+1,RND(1)*7+2                          FM
·167 B=DL(CL,1):IFBANDRND(1)+B/100>.95THE
NGOSUB200                                                        AN
·168 IFTI>ITTHENGOSUB247:GOTO181                                 KN
·169 IFJOY=NJTHEN165                                             CF
·170 IF(DL(CL+D(CD),.)ANDBO(5+CD))THEN172                        HA
·171 IFJOY=FJANDDL(CL+D(CD),.)THENCL=CL+D
(CD):GOTO180                                                     DC
·172 IF(DL(CL-D(CD),.)ANDBO(5))THEN174                           HN
·173 IFJOY=BJANDDL(CL-D(CD),.)THENCL=CL-D
(CD):GOTO180                                                     NO
·174 IFJOY=RJTHENCD=CD+1:GOTO179                                 LI
·175 IFJOY=LJTHENCD=CD-1:GOTO179                                 IP
·176 IFJOY=USTHENONU+1GOSUB210,211,4,219,
221,226,229,4,4:GOTO165                                          PB
·177 IFJOY=MUTHENGOSUB185:GOSUB322:GOTO16
5                                                                JA
·178 GOSUB319:GOSUB322:GOTO165                                   PL
·179 CD=CD+((CD=5)*4)+((CD=.)*-4)                                DH
·180 GOSUB97:GOTO165                                             FP
·181 VS=VS+1:IFVS=DD*6THENVS=.:DD=DD+((DD
<6)*-1):IFDD=6THENL=(LAND254)                                    EO
·182 LF=LF+((LF<60)*-.2):IF(LAND1)=.THEND
D=6                                                              HN
·183 POKEV+32,(LF<5)*-2+(LF>=5ANDLF<10)*-
7                                                                CN
·184 GOTO165                                                     CK
·185 POKE198,.                                                   JP
·186 IFCU=14THENCU=142:PRINTCHR$(9);CHR$(
CU);CHR$(8);:GOSUB280:POKEV+33,.                                 PE
·187 FORX=.TO8:IF(LANDBO(X))THENPOKEFNPM(
X),10                                                            AJ
·188 NEXT:X=.:A=FRE(.):A=.:IF(LAND(BO(U))
)THENPOKEFNPM(U),7                                               GC
·189 IFPEEK(56321)<>NJTHEN189                                    NM
·190 POKEFNPM(X),1:IF(LANDBO(A))THENPOKEF
NPM(A),10:GOTO192                                                IM
·191 POKEFNPM(A),2                                               NP
·192 JY=PEEK(56321):GETA$:IFA$=CHR$(140)T
HEN259                                                           EF
·193 P=L:IFJY=RJTHENA=X:X=X+1+(X=8)*9                            HA
·194 IFJY=USAND(LANDBO(X))THENPOKEFNPM(U)
,10:U=X:POKEFNPM(X),7:GOSUB319                                   FC
·195 IFJY=USTHENRETURN                                           MK
·196 IFJY=FJAND(DL(CL,2)ANDBO(X))THENL=(L
ORBO(X)):DL(CL,2)=DL(CL,2)-BO(X)                                 HP
·197 IFJY=BJAND(LANDBO(X))THENL=(LAND(511
-BO(X))):DL(CL,2)=DL(CL,2)ORBO(X):U=.                            OM
·198 IFL<>PTHENGOSUB319:GOSUB97:GOTO186                          FC
·199 GOTO190                                                     CK
·200 IFB=6THENU=.:DL(HX,2)=DL(HX,2)OR(LAN
D238):L=LAND273                                                  HL
·201 IFCU=14THENRETURN                                           HI
·202 D=INT(RND(1)*3+1):POKEV+33,HC(D-1):L
F=LF-(B/((LAND4)+1))+-D                                          GI
·203 FORT=1TO100:NEXT:POKEV+33,.:IFLF<1TH
EN205                                                            JA
·204 POKEV+32,(LF<5)*-2+(LF>=5ANDLF<10)*-
7:GOSUB324:GOSUB322:RETURN                                       PJ
·205 POKEV+33,.:POKEV+32,.:GOSUB277:PRINT
"[CLEAR][RVSON][c 4]"TAB(9)"THOU ART SLA
IN !                                                             AC
·206 PRINT"[RVSON][WHITE][DOWN][DOWN] DO
YOU WISH TO ENTER THE VAULT AGAIN?":POKE
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198,.                                                    IA
·207 GETA$:IFA$=""THEN207                                IG
·208 IFA$="N"THENPOKE648,4:POKE679,.:SYS6
79                                                       AP
·209 POKEV+21,.:RUN                                      BO
·210 IFDD=6AND(LAND1)THENVS=.:DD=1:GOSUB9
7:RETURN                                                 JE
·211 IFB=.ORRND(.)+LF/100<.5THENGOSUB324:
RETURN                                                   KI
·212 POKEV+33,5:FORT=1TO100:NEXT:POKEV+33
,.:FORX=.TO15                                            KL
·213 ON1-(M(X)=.)GOTO214,217                             KJ
·214 IFCL=M(X)THENMH(X)=MH(X)-ABS(RND(.)+
((LAND2)*1)+LF/5)                                        PM
·215 IFMH(X)>.THEN217                                    NM
·216 M(X)=.:DL(CL,1)=.:POKEV+21,PEEK(V+21
)AND240:GOSUB277:GOSUB218                                IL
·217 NEXT:GOSUB324:GOSUB322:RETURN                       CA
·218 LF=LF+B/4:DL(CL,2)=(DL(CL,2)ORBO(B-1
)):GOSUB97:GOSUB319:RETURN                               PO
·219 CU=RU-CU:PRINTCHR$(9);CHR$(CU);CHR$(
8);:POKEV+33,(CU=14)*-4                                  LM
·220 GOSUB280:GOSUB322:RETURN                            EI
·221 IF(DL(CL,.)ANDBO(2))THENCL=CL+128:GO
SUB315:GOSUB97:GOSUB322:RETURN                           FJ
·222 IF(DL(CL,.)AND24)=24AND(LAND384)=384
THENDL(CL,2)=DL(CL,2)ORBO(8):L=LAND255                   FO
·223 IF(DL(CL,.)AND24)=24THENCL=CL-128:GO
SUB312:GOSUB97:GOSUB322:RETURN                           GL
·224 IFCL=WLANDL=ALLTHEN232                              GO
·225 GOSUB319:GOSUB322:RETURN                            GL
·226 IFB=6THENGOTO212                                    HK
·227 DL(CL+D(CD),.)=(DL(CL+D(CD),.)AND63)
:GOSUB280:GOSUB322                                       HF
·228 RETURN                                              IM
·229 IF(DL(CL+D(CD),.)ANDBO(5))=.THENRETU
RN                                                       DG
·230 IF(DL(CL+D(CD),.)ANDBO(5+CD))THENDL(
CL+D(CD),.)=DL(CL+D(CD),.)-BO(5+CD)                      ML
·231 GOSUB324:GOSUB322:RETURN                            FN
·232 PRINT"[CLEAR]":PRINT"[DOWN][DOWN][RV
SON][WHITE] THE [RED]CROWN [CYAN]OF [PUR
PLE]SARNOTH [RED]HAS [YELLOW]BEEN [WHITE
]RETURNED!"                                              FB
·233 PRINT"[RVSON][c 7] NOBLE WARRIOR,YOU
 HAVE SURVIVED VAULT ":GOSUB280:GOTO206                  AP
·234 FORX=1TO33:READA:POKE680+X,A:NEXT:PO
KE56334,PEEK(56334)AND254                                CE
·235 POKE1,PEEK(1)AND251:SYS681:POKE1,PEE
K(1)OR4:POKE56334,PEEK(56334)OR1                         JE
·236 READA:IFA=-1THENRETURN                              KN
·237 FORX=.TO7:READD:POKE61440+A*8+X,D:NE
XT:GOTO236                                               DH
·238 PRINTCHR$(142)CHR$(8)CHR$(31)CHR$(19
);                                                       FD
·239 FORH=1TO36:PRINT"[cEP]";:NEXT:FORV=1
TO23:PRINTTAB(1)"[cEP]"TAB(37)"[cEP]"                    PO
·240 NEXT:FORH=1TO38:PRINT"[cEP]";:NEXT                  FJ
·241 PRINT"[HOME][DOWN][DOWN]"TAB(2)"[PUR
PLE][3" "]PREPARE THYSELF,BRAVE WARRIOR[
3"."][DOWN]"                                             MN
·242 PRINTTAB(2)"[RVSON][c 4] [RVSOFF]$[R
VSON] V A U L T O F T E R R O R [RVS
OFF]$[RVSON] "                                           OJ
·243 PRINTTAB(4)"[DOWN][DOWN][RVSOFF][GRE
EN] A [WHITE]3-D[GREEN]IMENSIONAL [WHITE
]ADVENTURE[GREEN] GAME  "                                BL
·244 PRINT"[9"[DOWN]"] "TAB(2)"[RVSON] PL
EASE WAIT[5"."]OPENING DUNGEON[3"!"]"                    PP
·245 RETURN                                              IM
·246 D=.:FC=8:IFCL>127THEND=9:FC=15                      AB
·247 P=6:D=.:FC=8:IFCL>127THEND=9:FC=15                  LH
·248 FORX=DTOFC:ON1-(M(X)=.)GOTO249,255                  PD
·249 IFCL<M(X)-PTHENA=M(X)+D(4)                          NB
·250 IFCL>M(X)+PTHENA=M(X)+D(2)                          MM
·251 IFCL>M(X)ANDCL<M(X)+PTHENA=M(X)+D(1)                OI
·252 IFCL<M(X)ANDCL>M(X)-PTHENA=M(X)+D(3)                ND
·253 IFA<.ORA>255THEN255                                 FA
·254 IFDL(A,.)ANDDL(A,1)=.THENDL(A,1)=DL(
M(X),1):DL(M(X),1)=.:M(X)=A                              OK
·255 NEXT                                                IA
·256 D=DL(CL,1):IFDTHENONDGOSUB288,288,29
6,296,301,4,308,305:GOSUB322                             ND
·257 POKEV+21,.:FC=.:GOSUB116:IT=TI+1000:
RETURN                                                   JB
·258 RETURN                                              IM
·259 PRINT"[HOME][RVSOFF][BLUE] SAVING";                 KN
·260 OPEN1,8,15:PRINT#1,"S0:LASTDUNGEON":
CLOSE1                                                   IL
·261 OPEN1,8,2,"LASTDUNGEON,U,W":FORX=.TO
2:FORD=.TO255:PRINT#1,DL(D,X)CR$                         EP
·262 NEXTD:PRINT".";:NEXTX:PRINT".";:FORX
=.TO15:PRINT#1,M(X),CR$,MH(X),CR$                        OF
·263 NEXTX:PRINT".";                                     GH
·264 PRINT#1,CL,CR$,CD,CR$,LF,CR$,L,CR$,U
,CR$,DD,CR$,VS,CR$,HX,CR$,WL,CR$                         CM
·265 PRINT#1,CC,CR$                                      HC
·266 CLOSE1:GOTO185                                      DJ
·267 PRINT"[4"[UP]"]":PRINTTAB(7);:INPUT"
[RVSON] FILENAME  ";A$:A$=LEFT$(A$,11)                   MO
·268 F$="LASTDUNGEON":IFA$<>"[cEP]"THENF$
=A$                                                      OH
·269 OPEN1,8,15:PRINT#1,"I0:":CLOSE1:OPEN
1,8,2,F$+",U,R"                                          LH
·270 FORX=.TO2:FORD=.TO255:INPUT#1,DL(D,X
):NEXTD,X:FORX=.TO15                                     DC
·271 INPUT#1,M(X),MH(X)                                  FF
·272 NEXTX                                               NK
·273 INPUT#1,CL,CD,LF,L,U,DD,VS,HX,WL,CC                 NG
·274 CLOSE1:OPEN1,8,15:INPUT#1,A,B$,C,D:C
LOSE1                                                    KL
·275 IFATHENPRINT"[HOME][WHITE][RVSON]"TA
B(8)A;B$;C;D                                             KD
·276 FORT=1TO5000:NEXT:RETURN                            MP
·277 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5:POKES+5,8:POKES+6,255                                  LB
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·278 POKES+4,21:F1=2:FORZ=1TO24:F2=80:POK
ES+1,F1:FORY=1TO5:POKES+15,F2                FE
·279 F2=F2/1.1:NEXTY:F1=F1+9:NEXTZ:POKES+
6,15:RETURN                                  HH
·280 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·281 POKES+5,8:POKES+6,255:POKES+4,23:F1=
10                                           BG
·282 FORZ=1TO30:F2=30:POKES+1,F1:FORY=1TO
10:POKES+15,F2                               OC
·285 F2=F2*1.01:NEXT:F1=F1+1:NEXT:POKES+6
,15:RETURN                                   FC
·288 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·289 POKES+5,8:POKES+6,255:POKES+4,23:F1=
11:F2=25                                     OJ
·290 FORZ=5TO50:POKES+1,F1:POKES+15,F2:F2
=F2*.97:F1=F1+1:NEXT:POKES+6,15:RETURN       OE
·296 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5:POKES+5,24:POKES+6,248:POKES+4,33          NJ
·299 FORP=17TO13STEP-1:POKES,P:FORT=125TO
135:POKES+1,T:NEXTT,P:POKES+4,32             JF
·300 RETURN                                  IM
·301 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·302 POKES+5,8:POKES+6,255:POKES+4,23:F1=
15:F2=F1                                     PN
·303 FORZ=1TO10:POKES+1,F1:POKES+15,F2:F2
=F2*1.01:F1=F1*1.3:NEXTZ                     OI
·304 POKES+6,15:RETURN                       CA
·305 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5:POKES+5,8:POKES+6,255:POKES+4,23           GE
·306 F1=8:F2=4:FORZ=1TO30:POKES+1,F1:POKE
S+15,F2:F2=F2*1.01:F1=F1+1:NEXT              KO
·307 POKES+6,15:RETURN                       CA
·308 FORP=STOS+24:POKEP,.:NEXT               CN
·309 POKES+24,15:POKES+5,155:POKES+6,245     OH
·310 POKES+4,129:FORP=50TO55:POKES,D         CE
·311 FORT=35TO55:POKES+1,T:NEXTT,P:POKES+
4,128:FORT=1TO100:NEXT:RETURN                CE
·312 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·313 POKES+5,8:POKES+6,255:POKES+4,23:FOR
F1=4TO18STEP2:POKES+15,F1                    CI
·314 FORF2=10TO180STEP2:POKES+1,F2:NEXTF2
,F1:POKES+6,15:RETURN                        NM
·315 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·316 POKES+5,8:POKES+6,255:POKES+4,23        GF
·317 FORF=15TO8STEP-1:FORF1=18TO10STEP-2:
POKES+15,F1                                  JA
·318 FORF2=12TO4STEP-1:POKES+1,F2:POKES+1
5,F:NEXTF2,F1,F:POKES+6,15:RETURN            GP
·319 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·320 POKES+5,96:POKES+6,96:POKES+4,23:POK
ES+2,85:POKES+1,36                           IG
·321 FORF=1TO10:NEXT:POKES+6,15:RETURN       OI
·322 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·323 POKES+1,10:POKES,5:POKES+5,129:POKES
+6,129:POKES+4,21:RETURN                     BI
·324 FORP=STOS+24:POKEP,.:NEXT:POKES+24,1
5                                            MM
·325 POKES+1,25:POKES,5:POKES+5,20:POKES+
6,20:POKES+4,129:FORT=1TO75:NEXT             MP
·326 POKES+4,128:RETURN                      EH
·327 DATA 169,,133,251,133,253,169,208,13
3,252,169,240,133,254,162,8                  IB
·328 DATA 160,,177,251,145,253,136,208,24
9,230,252,230,254,202,208,240,96             IC
·329 DATA035,24,60,110,110,110,110,110,11
0                                            BJ
·330 DATA036,255,199,231,129,,60,126,255     KF
·331 DATA037,255,60,24,255,219,153,153,24    KF
·332 DATA038,24,24,60,102,102,60,,           MG
·333 DATA039,,126,127,127,112,126,,255       PD
·334 DATA040,110,110,110,110,110,110,110,
110                                          EK
·335 DATA042,60,60,255,153,60,60,60,60       HG
·336 DATA081,255,231,231,231,231,219,195,
231                                          DO
·337 DATA083,231,195,153,189,165,153,195,
255                                          PD
·338 DATA086,27,31,31,27,59,123,219,155      CH
·339 DATA088,126,102,102,126,24,24,30,30     DK
·340 DATA091,216,248,248,216,220,222,219,
217                                          JI
·341 DATA092,175,88,171,88,168,88,168,88     CL
·342 DATA102,219,54,219,102,219,54,219,10
2                                            OK
·343 DATA104,24,255,192,192,192,255,24,24    BA
·344 DATA107,31,24,31,24,31,24,31,24         JM
·345 DATA108,255,182,255,191,240,176,247,
176                                          JE
·346 DATA109,255,129,255,129,255,255,129,
255                                          BK
·347 DATA115,248,24,248,24,248,24,248,24     GD
·348 DATA123,255,109,255,253,15,13,239,13    JH
·349 DATA163,255,159,159,239,247,251,253,
255                                          IN
·350 DATA164,239,239,239,239,239,199,239,
239                                          EG
·351 DATA165,189,129,153,189,165,129,195,
231                                          MG
·352 DATA166,255,255,231,219,219,231,255,
255                                          MD
·353 DATA167,207,183,123,195,129,,255,255    ED
·354 DATA168,199,239,131,239,239,239,239,
239                                          IJ
·355 DATA169,199,215,199,239,239,239,231,
231                                          CI
·356 DATA170,129,195,231,195,153,16,153,1
95                                           KE
·357 DATA171,255,255,102,,90,,255,255        AC
·358 DATA173,255,129,255,255,231,231,255,
```

```
 255                                                    IP
·359 DATA186,255,231,255,231,255,231,255,
 231                                                    CN
·360 DATA189,255,129,255,239,255,129,255,
 239                                                    EK
·361 DATA197,255,,255,255,255,255,,255                 DE
·362 DATA220,250,21,218,21,26,21,26,21                 IP
·363 DATA230,54,177,129,108,108,153,153,1
 02                                                     MI
·364 DATA242,255,255,189,189,129,255,219,
 255,-1                                                 EA
·365 DATA .,,,,,,,,,,,,,,,,.                           MH
·366 DATA .,8,2,1,2,1,,1,1,1,,1,352,4,2,.              JC
·367 DATA .,1,,16,,1,,1,,1,32,1,,2,2,.                 FI
·368 DATA .,1,,1,1,2,16,1,,1,,1,,,1,.                  FO
·369 DATA .,4,1,2,,1,,1,2,1,1,2,1,,4,.                 HL
·370 DATA .,1,,1,,1,1,1,,,,,1,,,,.                     KK
·371 DATA .,2,1,1,1,1,32,1,1,4,1,2,1,1,34
 ,,                                                     IO
·372 DATA .,,,,,,,,,,,,,,,,.                           MH
·373 DATA .,2,1,1,2,16,2,1,1,1,,2,2,2,2,.              OI
·374 DATA .,1,,1,,1,,1,,1,1,1,1,984,2,.                LO
·375 DATA .,2,1,1,,1,2,1,2,1,,32,2,2,2,.               FG
·376 DATA .,,,2,,1,,1,,1,,129,,,,,.                    CG
·377 DATA .,24,1,1,1,1,,2,1,1,,1,65,,24,.              NI
·378 DATA .,1,,,1,,1,1,1,,1,,,1,,.                     FG
·379 DATA .,1,2,2,1,2,1,,,168,,129,2,1,1,
 .                                                      MB
·381 DATA "[UP][RIGHT][s +][DOWN][RVSOFF]
 [LEFT][s M][s M][DOWN][LEFT][s M][s M]"                GA
·382 DATA "[UP][UP]#[DOWN][LEFT]([DOWN][L
 EFT]([DOWN][LEFT]*"                                    NG
·383 DATA "[UP][RVSON][c *][RIGHT][RIGHT]
 [sEP][DOWN][4"[LEFT]"][s B][RVSOFF]$$[RV
 SON][s B][DOWN][4"[LEFT]"][s B][c R][c R
 ][s B]"                                                IK
·384 DATA "[DOWN]&"                                     PN
·385 DATA "[s J][s I][DOWN][LEFT][LEFT][3
 "[c +]"]"                                              KF
·386 DATA "[UP]*[DOWN][LEFT][RVSOFF][s B]
 [DOWN][LEFT][s B]"                                     BB
·387 DATA "[DOWN][LEFT][s X]"                           FA
·388 DATA "[UP][UP][3"[LEFT]"][c *][RVSON
 ] [RVSOFF][sEP][DOWN][3"[LEFT]"][RVSON][
 sEP][c T][c *][DOWN][4"[LEFT]"][sEP] [RV
 SOFF]'[RVSON][SS][c *][DOWN][5"[LEFT]"][
 RVSOFF][c *][RVSON][3"[c T]"][RVSOFF][sE
 P]"                                                    IK
·389 DATA "[LEFT][LEFT][RVSON][c *][sEP][
 c *][sEP][DOWN][4"[LEFT]"][4"="]"                      JL
·390 DATA 1,1,2,2,3,3,4,5,5,6,6,6,7,7,7,8               LP
·391 DATA 1,1,2,2,3,4,<,<                               HF
·392 DATA 1,1,2,2,3,4,<,<                               HF
·393 DATA 1,1,2,2,3,65,":;",":;"                        NK
·394 DATA 1,1,2,2,3,65,":978",":978"                    NM
·395 DATA0,,,,,,,                                       PD
·396 DATA0,,,,4,,32,6                                   OC
·397 DATA0,96,5,60,160,8,255,16                         JE
·398 DATA016,255,8,19,255,200,36,255                    EC
·399 DATA036,9,255,144,18,255,72,37                     FF
·400 DATA126,164,42,60,84,36,24,36                      GF
·401 DATA042,60,84,4,90,32,2,126                        AN
·402 DATA064,1,90,128,,36,,                             AC
·403 DATA0,,,56,255,,67,255                             CO
·404 DATA192,55,255,224,15,255,240,15                   ED
·405 DATA255,240,15,255,240,14,255,176                  CE
·406 DATA014,127,48,30,190,184,62,221                   PJ
·407 DATA188,127,107,126,252,255,159,120                NB
·408 DATA221,143,120,73,7,56,127,3                      LK
·409 DATA024,93,3,12,8,30,30,                           FB
·410 DATA047,53,,10,85,,20,                             DJ
·411 DATA052,66,15,24,102,31,44,90                      KG
·412 DATA033,6,102,1,3,90,1,7                           BN
·413 DATA165,227,11,219,211,21,231,175                  PC
·414 DATA046,231,119,89,126,189,113,219                 II
·415 DATA153,96,165,1,113,153,129,107                   JI
·416 DATA126,193,102,195,97,37,129,161                  CP
·417 DATA015,,241,15,,241,10,                           DO
·418 DATA081,14,,113,58,,92,220                         OD
·419 DATA0,120,,,132,,1,74                              IC
·420 DATA016,1,2,40,3,135,40,5                          OO
·421 DATA134,144,14,205,144,31,123,208                  PH
·422 DATA061,183,248,61,207,228,41,183                  FH
·423 DATA100,41,207,44,41,255,56,26                     KB
·424 DATA001,24,3,207,,3,183,                           HP
·425 DATA007,207,,5,122,128,11,239                      NG
·426 DATA128,13,123,64,13,86,192,220                    HF
·427 DATA0,248,,1,4,,2,2                                FH
·428 DATA0,2,138,,2,2,,2                                EO
·429 DATA002,,2,3,6,3,7,9                               NF
·430 DATA003,143,9,3,223,9,13,254                       ID
·431 DATA198,30,253,230,63,123,246,127                  DO
·432 DATA183,255,191,207,247,223,183,250                JD
·433 DATA159,207,242,159,255,242,151,255                EA
·434 DATA210,103,255,204,2,,64,231                      FO
·435 DATA003,231,192,7,219,224,7,189                    LJ
·436 DATA224,15,219,224,15,231,240,15                   JJ
·437 DATA255,240,15,255,240,15,255,240                  KD
·438 DATA015,255,240,15,255,240,15,255                  IJ
·439 DATA240,15,255,240,31,255,248,31                   AP
·440 DATA255,248,31,127,216,61,239,124                  LG
·441 DATA047,191,236,58,250,172,45,149                  DN
·442 DATA246,95,86,174,164,221,202,102                  OM
·443 DATA0,,254,,1,127,,2                               HB
·444 DATA223,,4,207,,11,103,                            GE
·445 DATA021,191,,43,215,,87,223                        PF
·446 DATA0,87,224,,87,243,,91                           KO
·447 DATA251,,45,255,,22,255,                           PE
·448 DATA011,,,5,191,,2,192                             PO
·449 DATA0,1,63,,,213,,                                 AA
·450 DATA090,,,45,,,42,220                              MJ
·451 DATA127,,,254,128,,251,64                          ED
·452 DATA0,243,32,,230,208,,253                         FD
·453 DATA168,,235,212,,251,234,                         FB
·454 DATA007,234,,207,234,,223,218                      JP
·455 DATA0,255,180,,255,104,,                           IP
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 101 and 102 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
·456 DATA208,,253,160,,3,64,                PI
·457 DATA252,128,,171,,,90,                 CO
·458 DATA0,180,,,84,,,220                   JK
·459 DATA061,188,,42,84,,61,188             JI
·460 DATA0,42,84,,61,188,,62                NK
·461 DATA124,,45,180,,61,188,               KI
·462 DATA042,84,,45,180,,62,124             EP
·463 DATA0,61,188,,42,84,,61                EL
·464 DATA188,,42,84,,45,180,                PN
·465 DATA058,92,,45,180,,21,90              IB
·466 DATA0,22,173,,11,86,128,239            GI
·467 DATA002,189,64,3,195,192,2,189         OC
·468 DATA064,2,195,64,3,189,194,2           FB
·469 DATA195,65,3,189,193,2,67,67           CH
·470 DATA005,166,199,10,221,74,21,106       KH
·471 DATA156,38,182,148,91,87,92,108        MC
·472 DATA171,182,87,85,202,88,169,170       LF
·473 DATA103,214,106,89,69,214,39,255       AA
·474 DATA236,26,105,88,7,255,240,28         AE
·475 DATA007,231,224,11,126,208,21,60       DM
·476 DATA168,46,255,116,95,126,250,95       IA
·477 DATA129,250,95,189,250,47,255,244      GK
·478 DATA020,255,40,11,,208,4,255           PB
·479 DATA032,3,,192,2,230,64,3              GL
·480 DATA153,192,3,219,192,2,36,64          GK
·481 DATA002,219,64,3,36,192,2,219          JH
·482 DATA064,3,36,192,2,219,64,             JI
·483 DATA0,252,,1,122,,3,183                FE
·484 DATA0,3,207,,1,254,,                   ID
·485 DATA252,,,120,,,120,                   JI
·486 DATA0,120,,,120,,,120                  JO
·487 DATA0,,120,,,120,64,                   FB
·488 DATA120,32,,120,32,,252,96             LG
·489 DATA001,255,192,15,,224,31,255         AH
·490 DATA240,24,3,240,15,255,224,221        OK
```

DVORAK KEYBOARD

FROM PAGE 57

C-64 VERSION

```
·10 REM DVORAK KEYBOARD FOR THE C-64        ND
·20 FORT=49152TO49198:READDT:POKET,DT:NEX
 TT                                         HO
·30 SYS49152:POKE49153,0:POKE49154,224:PO
 KE49156,0:POKE49157,224                    ML
·40 POKE49162,255:POKE49192,255:SYS49152    LJ
·50 POKE1,53:REM ACTIVATE RAM KERNAL        EE
·60 FORT=0TO32:REM REDEFINE NORMAL KEY DE
 FS                                         JN
·70 READAD:READVA                           HP
·80 POKE60289+AD,VA                         KF
·90 NEXTT                                   NG
·100 FORT=0TO37:REM REDEFINE SHIFTED KEY
 DEFS                                       DH
·110 READAD:READVA                          HP
·120 POKE60354+AD,VA                        KK
·130 NEXTT                                  NG
·140 NEW:END                                GH
·150 REM ML ROUTINE FOR COPYING BASIC AND
  KERNAL ROM TO RAM                         IN
·160 DATA173,0,160,141,0,160,172,5,192,19
 2,191,240,23,238,1,192,238,4,192           FI
·170 DATA173,4,192,240,3,76,0,192,238,2,1
 92,238,5,192,76,0,192,172,4,192,192        AF
·180 DATA255,240,3,76,13,192,96             FD
·190 REM NON SHIFTED DATA                   LC
·200 DATA62,39,9,44,14,46,17,80,22,89,25,
 70,30,71,33,67,38,82,41,76,46,63           GE
·210 DATA13,79,18,69,21,85,26,73,29,68,34
 ,72,37,84,42,78,45,83,50,45                GI
·220 DATA12,59,23,81,20,74,31,75,28,88,39
 ,66,36,77,47,87,44,86,55,90,40,91,43,61    IM
·230 REM SHIFTED DATA                       MH
·240 DATA59,64,24,38,27,42,32,40,35,41,40
 ,93,43,43                                  GP
·250 DATA62,34,9,60,14,62,17,208,22,217,2
 5,198,30,199,33,195,38,210,41,204,46,47    HH
·260 DATA13,207,18,197,21,213,26,201,29,1
 96,34,200,37,212,42,206,45,211,50,45       IO
·270 DATA12,58,23,209,20,202,31,203,28,21
 6,39,194,36,205,47,215,44,214,55,218       BO
```

C-128 VERSION

```
·10 REM DVORAK KEYBOARD FOR THE C-128       LI
·20 FAST                                    CF
·30 FORI=0TO177:REM COPY DOWN NORMAL KEY
 DEFS                                       EA
·40 POKEDEC("1300")+I,PEEK(DEC("FA80")+I)   CM
·50 NEXTI                                   MN
·60 FORI=0TO177:REM COPY DOWN SHIFTED KEY
  DEFS                                      BE
·70 POKEDEC("1359")+I,PEEK(DEC("FAD9")+I)   FH
·80 NEXTI                                   MN
·90 REM CHANGE KEY TABLE POINTERS           FD
·100 POKE830,DEC("00")                      CN
·110 POKE831,DEC("13")                      EO
·120 POKE832,DEC("59")                      DD
·130 POKE833,DEC("13")                      DI
·140 REM REDEFINE NORMAL KEY DEFS           LN
·150 FORT=0TO32                             NN
·160 READAD:READVA                          HP
·170 POKEDEC("1300")+AD,VA                  NA
·180 NEXTT                                  NG
·190 REM REDEFINE SHIFTED KEY DEFS          LM
·200 FORT=0TO37                             NI
·210 READAD:READVA                          HP
·220 POKEDEC("1359")+AD,VA                  LE
·230 NEXTT                                  NG
·240 SLOW                                   CE
·250 NEW:END                                GH
```

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```
•260 REM NON SHIFTED DATA                                    LC
•270 DATA62,39,9,44,14,46,17,80,22,89,25,
 70,30,71,33,67,38,82,41,76,46,63                            GE
•280 DATA13,79,18,69,21,85,26,73,29,68,34
 ,72,37,84,42,78,45,83,50,45                                 GI
•290 DATA12,59,23,81,20,74,31,75,28,88,39
 ,66,36,77,47,87,44,86,55,90,40,91,43,61                     IM
•300 REM SHIFTED DATA                                        MH
•310 DATA59,64,24,38,27,42,32,40,35,41,40
 ,93,43,43                                                   GP
•320 DATA62,34,9,60,14,62,17,208,22,217,2
 5,198,30,199,33,195,38,210,41,204,46,47                     HH
•330 DATA13,207,18,197,21,213,26,201,29,1
 96,34,200,37,212,42,206,45,211,50,45                        IO
•340 DATA12,58,23,209,20,202,31,203,28,21
 6,39,194,36,205,47,215,44,214,55,218                        BO
```

DISK CHECKUP
FROM PAGE 97

```
•100 GOTO 280                                                CG
•110 REM INNER TRACE LOOP                                    NP
•120 PRINT#1,"U1 2 0";T;S                                    IN
•130 INPUT#1, EN,EM$,ET,ES                                   OA
•140 IF EN<>0 THEN GOTO 1960:REM DISK TRA
 CE ERROR                                                    AK
•150 LT%(I)=LT%(I)+1                                         HO
•160 IF OB%(T,S)<>0 THEN GOTO 1410:REM FI
 LE INTERSECT                                                FJ
•170 OB%(T,S)=I                                              AD
•180 GET#2,A$,B$                                             DH
•190 IF A$="" THEN GOTO 1450:REM TRACE LO
 OP CONTINUE                                                 FI
•200 IF B$="" THEN B$=CHR$(0)                                OE
•210 T=ASC(A$):S=ASC(B$)                                     EN
•220 GOTO 120:REM INNER TRACE LOOP                           EP
•230 REM******************************                      CE
•240 REM DISK CHECK-UP                                       AI
•250 REM                                                     JD
•260 REM   DON FULTON                                        FI
•270 REM******************************                      CE
•280 DIM I,S,T,X,Y,Z                                         GA
•290 DIM BC,EN,ES,ET,IM,LC,OF,PF,S1,S2,SF
 ,T1,T2                                                      EB
•300 DIM TS%(144),SS%(144),LD%(144),LT%(1
 44),PF%(144),N$(144)                                        NG
•310 DIM OB%(35,20)                                          HC
•320 CLOSE 1:OPEN 1,8,15:CLOSE 2:CLOSE 1                     AN
•330 REM------------------------------                      CD
•340 PRINT CHR$(147)                                         FG
•350 PRINT                                                   JJ
•360 PRINT "[12" "]DISK CHECK-UP                             OO
•370 PRINT "[11" "][c T]                                     LL
•380 PRINT " CHECKS:                                         OD
•390 PRINT                                                   JJ
•400 PRINT "  -- START LINKS DIFFERENT                       PB
•410 PRINT                                                   JJ
•420 PRINT "  -- TRACE FILE LEN = DIR FIL
 E LEN                                                       NA
•430 PRINT                                                   JJ
•440 PRINT "  -- FILES DO NOT OVERLAP                        HC
•450 PRINT                                                   JJ
•460 PRINT "  -- (3) BLOCKS FRE                              FO
•470 PRINT                                                   JJ
•480 REM------------------------------                      DD
•490 REM SHO        -36 CY-                  SHP             NP
•500 REM CMG                                 CMM             GB
•510 REM CMG       BOX BELOW                 CMM             BD
•520 REM CMG                                 CMM             GB
•530 REM SHL        -36 CP-                  SH@             FJ
•540 REM------------------------------                      DD
•550 PRINT " [s 0][36"[c Y]"][s P]                           HL
•560 PRINT " [c G]THIS UTILITY DOES NOT W
 RITE TO DISK.[c M]                                          EN
•570 PRINT " [c G][36" "][c M]                               CK
•580 PRINT " [c G][3" "][RVSON](PROBLEM F
 ILES ARE DISPLAYED)[RVSOFF][4" "][c M]                      IA
•590 PRINT " [c G][10" "][RVSON]IN INVERS
 E VIDEO)[RVSOFF][9" "][c M]                                 OK
•600 PRINT " [s L][36"[c P]"][s @]                           PM
•610 FOR X=1 TO 1000:NEXT                                    DO
•620 PRINT                                                   JJ
•630 REM------------------------------                      CD
•640 REM FIND START OF ACTIVE FILES                          HM
•650 PRINT                                                   JJ
•660 PRINT "[6" "]START[20" "]LENGTH  "                      GB
•670 PRINT "FILE  T , S[4" "]FILE NAME[5"
  "]DIR--TRACE"                                              CE
•680 PRINT "[4"[c T]"]  [5"[c T]"][3" "][
 11"[c T]"][4" "][3"[c T]"]  [5"[c T]"]"                     DD
•690 OPEN 1,8,15                                             PG
•700 OPEN 2,8,2,"#"                                          EI
•710 T1=18:S1=1:I=1                                          KH
•720 REM NEXT DIRECTORY SECTOR                               LJ
•730 :  IF T1=0 THEN GOTO1010:REM DIRECTO
 RY CLOSE                                                    BI
•740 :  PRINT#1,"U1 2 0";T1;S1                               EI
•750 :  INPUT#1, EN,EM$,ET,ES                                JL
•760 :  IF EN<>0 THEN GOTO 1980:REM DISK
 ERROR                                                       PN
•770 :  GET#2,A$,B$                                          IE
•780 :  T2=T1:S2=S1                                          EG
•790 :  T1=ASC(A$+CHR$(0))                                   DG
•800 :  S1=ASC(B$+CHR$(0))                                   CK
•810 :  FOR X=2 TO 255 STEP 32                               CJ
•820 :    PRINT#1,"U1 2 0";T2;S2                             FF
•830 :    PRINT#1,"B-P 2";X                                  FI
•840 :    INPUT#1, EN,EM$,ET,ES                              LI
•850 :    IF EN<>0 THEN GOTO 1980:REM DIS
 K ERROR                                                     CK
```

```
·860 :    GET#2,C$,D$,E$,F$,G$,H$,I$,J$,K
 $,L$,M$,N$,O$,P$,Q$,R$,S$,T$,U$          KM
·870 :    IF C$="" THEN GOTO 980:REM DIRE
 CTORY CONTINUE                           MG
·880 :    TS%(I)=ASC(D$+CHR$(0))           FB
·890 :    SS%(I)=ASC(E$+CHR$(0))           GF
·900 :    N$(I)=F$+G$+H$+I$+J$+K$+L$+M$+N
 $+O$+P$+Q$+R$+S$+T$+U$                   LI
·910 :    PRINT#1, "B-P 2";X+28            GB
·920 :    GET#2,V$,W$                      NN
·930 :    LD%(I)=ASC(V$+CHR$(0))+256*ASC(
 W$+CHR$(0))                              NH
·940 :    PRINT I;TAB(4)TS%(I);TAB(8)",";
 TAB(9)SS%(I);                            IC
·950 :    PRINT TAB(13)N$(I);TAB(29)LD%(I
 );TAB(33);"--";LT%(I)                    MA
·960 :    I=I+1                            MJ
·970 :    REM  DIRECTORY CONTINUE          BM
·980 :    NEXT                             DM
·990 GOTO 730:REM NEXT DIRECTORY SECTOR    IM
·1000 REM DIRECTORY CLOSE                  PI
·1010 IM=I-1                               GN
·1020 CLOSE 2:CLOSE 1                      CI
·1030 REM------------------------------    NE
·1040 PRINT                                JJ
·1050 PRINT " CHECKING START LINKS FOR OV
 ERLAP"                                   HM
·1060 PRINT                                JJ
·1070 IF IM=0 OR IM=1 THEN GOTO 1250:REM
  START LINK END                           ON
·1080 FOR I=2 TO IM                        FJ
·1090 :  FOR Y=1 TO I-1                    GN
·1100 :    IF TS%(Y)=TS%(I)THEN IF SS%(Y)
 =SS%(I)THEN GOTO 1150:REM FILE OVERLAP    NK
·1110 :  NEXT                              PP
·1120 NEXT                                 IA
·1130 GOTO 1250:REM START LINK END         CO
·1140 REM FILE OVERLAP                     BO
·1150 :    PF%(I)=1:PF%(Y)=1               GM
·1160 :    OF=1:REM SET OVERLAP FLAG       AK
·1170 :    PRINT Y;CHR$(18);TAB(4)TS%(Y);
 TAB(8)",";                               EH
·1180 :    PRINT TAB(9)SS%(Y);TAB(13)N$(Y
 );CHR$(146);                             LO
·1190 :    PRINT TAB(29)LD%(Y);TAB(33);"-
 -";LT%(Y)                                LI
·1200 :    PRINT I;CHR$(18);TAB(4)TS%(I);
 TAB(8)",";                               IH
·1210 :    PRINT TAB(9)SS%(I);TAB(13)N$(I
 );CHR$(146);                             DO
·1220 :    PRINT TAB(29)LD%(I);TAB(33);"-
 -";LT%(I)                                FI
·1230 GOTO 1110:REM START LINK CONTINUE    HN
·1240 REM  START LINK END                  LM
·1250 IF OF=0 THEN PRINT "[5" "]--START L
 INKS OK--"                               IH
·1260 REM------------------------------    KC
·1270 PRINT                                JJ
·1280 PRINT " TRACING FILES"               KC
·1290 PRINT                                JJ
·1300 OPEN 1,8,15                          PG
·1310 OPEN 2,8,2,"#"                       EI
·1320 IF IM=0 THEN GOTO 1530:REM TRACE EN
 D                                         KO
·1330 FOR I=1 TO IM                        FI
·1340 :    T=TS%(I)                        BC
·1350 :    S=SS%(I)                        BC
·1360 :    LT%(I)=0                        PD
·1370 :    PF$=""                          GN
·1380 :    SF=0                            CH
·1390 :    GOTO 120:REM INNER TRACE LOOP   KI
·1400 :    REM FILE INTERSECT              FA
·1410 :    PF%(OB%(T,S))=1                 DO
·1420 :    PF%(I)=1                        OA
·1430 :    SF=1:REM SET INTERSECT FLAG     FN
·1440 :    REM TRACE LOOP CONTINUE         GG
·1450 :    BC=BC+LT%(I)                    GJ
·1460 :    PRINT I;TAB(4)TS%(I);TAB(8)","
 ;TAB(9)SS%(I);                           IC
·1470 :    IF LT%(I)<>LD%(I) THEN PF%(I)=
 PF%(I)+2:PRINT CHR$(18);                 CM
·1480 :    PRINT TAB(13)N$(I);TAB(29)LD%(
 I);TAB(33);"--";LT%(I)                   MA
·1490 :    IF PF$<>""THEN PRINT "[3" "](F
 ILE";I;"CONTAINS ";+PF$;")":PRINT        FG
·1500 :    IF SF=1 THEN PRINT "[3" "](FIL
 E";I;"INTERSECTS FILE ";OB%(T,S);")":PRI
 NT                                       PC
·1510 NEXT                                 IA
·1520 REM TRACE END                        CM
·1530 CLOSE 2:CLOSE 1                      CI
·1540 REM------------------------------    NE
·1550 PRINT                                JJ
·1560 PRINT " PROBLEM FILES--"             MI
·1570 PRINT " [13"[c T]"]"                 IF
·1580 IF IM=0 THEN GOTO 1710:REM PROBLEM
 FILE END                                  CO
·1590 FOR I=1 TO IM                        FI
·1600 :  IF PF%(I)=0 THEN GOTO 1690:REM P
 ROBLEM LOOP CONTINUE                      IE
·1610 :  PF=1:REM SET PROBLEM FILE FLAG    KG
·1620 :  PRINT I;                          LL
·1630 :  IF PF%(I)=1 OR PF%(I)=3 THEN PRI
 NT CHR$(18);                              PG
·1640 :  PRINT TAB(4)TS%(I);TAB(8)",";TAB
 (9)SS%(I);                                CE
·1650 :  PRINT CHR$(18);TAB(13)N$(I);CHR$
 (146);                                    FM
·1660 :  IF PF%(I)=2 OR PF%(I)=3 THEN PRI
 NT CHR$(18);                              OD
·1670 :  PRINT TAB(29)LD%(I);TAB(33);"--"
 ;LT%(I)                                   BH
·1680 :  REM  PROBLEM LOOP CONTINUE        LM
·1690 NEXT                                 IA
·1700 REM PROBLEM FILE END                 OM
·1710 IF PF=0 THEN PRINT "[6" "]NONE"      GB
```

```
•1720 PRINT                                          JJ
•1730 PRINT " BLOCK COUNT = ";BC                     NP
•1740 PRINT                                          JJ
•1750 PRINT " BLOCKS FREE = ";664-BC;TAB(
 20)"(TRACE)"                                        CO
•1760 FOR I=0 TO IM                                  FH
•1770 :  LC=LC+LD%(I)                                EA
•1780 NEXT                                           IA
•1790 PRINT " BLOCKS FREE = ";664-LC;TAB(
 20)"(DIR)"                                          OH
•1800 REM-----------------------------               NE
•1810 REM DIR BAM BLOCKS FREE                        KG
•1820 OPEN 1,8,15                                    PG
•1830 OPEN 2,8,2,"#"                                 EI
•1840 PRINT#1,"U1 2 0";18;0                          EA
•1850 INPUT#1, EN,EM$,ET,ES                          BP
•1860 IF EN<>0 THEN GOTO 1980:REM DISK ER
 ROR                                                 PO
•1870 FOR X=0 TO 35                                  CC
•1880 :  GET#2,W$,X$,Y$,Z$                           DK
•1890 :  IF X<>0 AND X<>18 THEN BU=BU+ASC
 (W$+CHR$(0))                                        JE
•1900 NEXT                                           IA
•1910 PRINT " BLOCKS FREE = ";BU;TAB(20)"
 (BAM)"                                              KN
•1920 CLOSE 2:CLOSE 1                                CI
•1930 END                                            IC
•1940 REM-----------------------------               NE
•1950 REM DISK TRACE ERROR                           EI
•1960 IF EN=66 THEN PF$="ILLEGAL LINK":GO
 TO 1450:REM TRACE LOOP CONTINUE                     LB
•1970 REM DISK ERROR                                 IP
•1980 PRINT                                          JJ
•1990 PRINT " UNRECOVERABLE DISK ERROR"              GI
•2000 PRINT                                          JJ
•2010 PRINT EN;EM$;ET;ES                             NP
•2020 CLOSE 2:CLOSE 1                                CI
•2030 END                                            IC
```

SCUTTLEBUTT

Continued from page 14

within a range of 10,000 years, and zoom in for views of constallations, the moons of Jupiter, a solar eclipse, the position of Halley's Comet, the Virgo Cluster of galaxies, Venus crossing the sun, and more. Price is $64.95; lab pack, $194.85.

CBS Interactive Learning, 203-622-2500 (see address list, page 14).

AMIGA MANUAL

The final release in Addison-Wesley's four-volume Amiga Technical Reference Series, the *Amiga ROM Kernal Reference Manual: Libraries and Devices* ($34.95), lists and describes the Amiga's built-in ROM routines and systems software which support graphics, sound, and animation. (Previously published were the *Amiga Hardware Reference Manual, Amiga Intuition Reference Manual,* and *Amiga ROM Kernal Reference Manual: Exec,* each $24.95.)

Addison-Wesley Publishing Company, 617-944-3700 (see address list, page 14).

DIGITAL SAMPLING

Sampler-64 allows the musician to digitally convert audible sound into a series of numbers that can be stored in memory, processed in various ways, and replayed on a keyboard. Complex sounds can be created with facilities like looping, dubbing (mixing different sampled sounds), block editing (dividing a sample into eight blocks which can be arranged at will), echo, and reverb. The package includes a small hardware box that attaches to the 64's user port, menu-driven software, a microphone, and a cable to route output to a TV. A MIDI interface that will be available by the end of the year will allow keyboard control of *Sampler-64*, and incorporate a sequencer. Price is $89.95 plus $3.50 shipping; PA residents add 6% sales tax.

The *Com-Drum* upgrade for *Sampler-64* turns the program into a drum machine, with real time and step time sequencer, three different drumkits with eight precussion sounds to each, and variable tempos and time signatures. Price is $29.95, or $14.95 when purchased with *Sampler-64*. (PA residents add 6%.)

Micro Arts Products, 215-336-1199 (see address list, page 14).

HOW-TO PROGRAMS

ShareData will market a *Home Companion* series of interactive how-to software, providing information to help the user diagnose and solve specific problems in areas like auto maintenance, weight control and nutrition, and money management. Twenty programs are planned, with five scheduled for fall release. Price will be under $10 each.

ShareData, Inc., 612-829-0409 (see address list, page 14).

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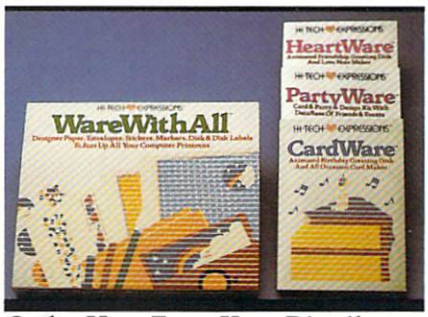

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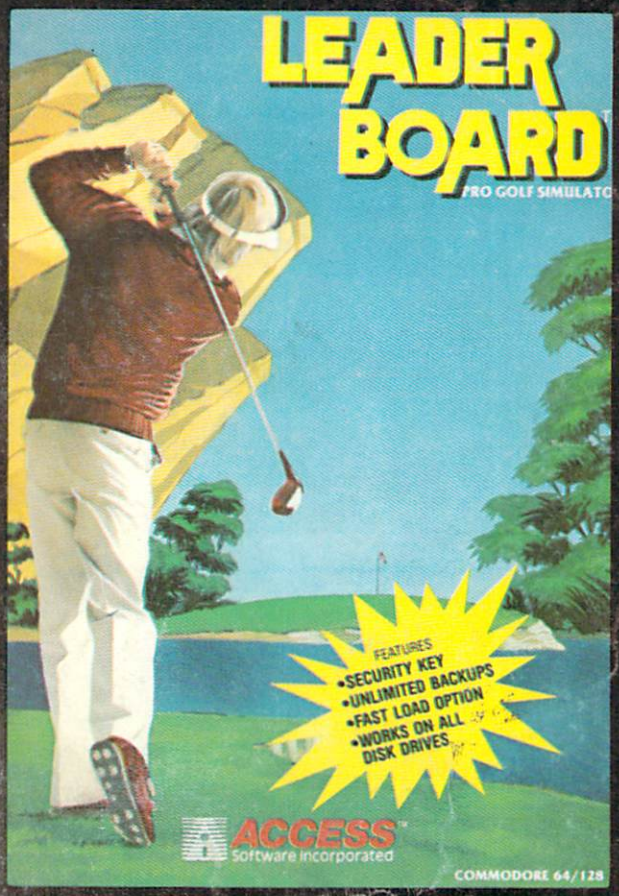

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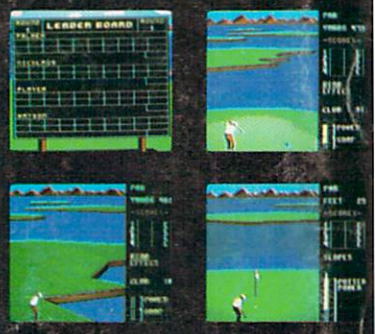

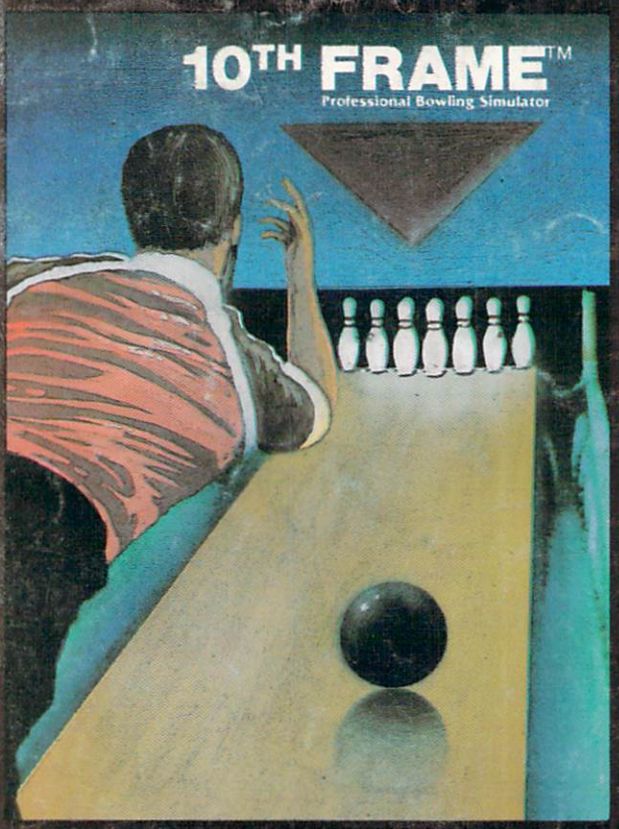

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